ENERGY SAVINGS
OPPORTUNITY SURVEY
(ESOS)
OF
SCHOFIELD BARRACKS
FAMILY HOUSING
AREAS
A, D, E, F, I, J, K-1

U.S. ARMY CONTRACT NO. DACA83-89-D-0073

FINAL SUBMITTAL

VOLUME I

PREPARED BY:

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SEPTEMBER 9, 1992

CESAM-EN-CM 12/03/92

MEMO FOR RECORD:

SUBJECT: Energy Savings Opportunity Study, Schofield Barracks, HI

This study is an example of a pitfall that should be avoided in the future. The results of the study are acceptable; the only problem encountered with the AE was that they were late with the final submittal. However, the pitfall is that a large effort was expended to investigate very limited potential savings. This study was limited to the family housing area at Schofield Barracks, Hawaii. The only energy source for the quarters is electricity; and they are neither heated nor air conditioned. This really leaves very few possibilities for energy conservation. The ones that readily come to mind are lighting improvements and domestic hot water; and the results of the report confirm this. Although the entire list of standard ECOs was included in the scope of work, the only two that resulted in recommendations were replacing incandescent fixtures with fluorescent fixtures and repairing existing domestic hot water heat pumps. Most of the ECOs on the list were not investigated because they were not applicable. So we spent $68,000 and got a 6-inch thick report for two recommended projects with projected annual savings of $115,000. This represents a savings, but we really spent more than we had to.

Could we have avoided this pitfall? Probably. Solicit input from local people, ie, DEH engineers and shop personnel, occupants, operations personnel, etc; they have intimate knowledge about the facilities and may have ideas for energy conservation opportunities. Cut the fat out of the scope of work; focus on the most likely ECOs. This takes extra effort in preparation of the scope of work, but it pays off by reducing the AE's effort and our cost.

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Marie Wakefield,
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I. <u>Introduction/Background</u>:

This study provides an energy survey of the family housing quarters in Areas A, D, E, F, I, J, & K-1 of Schofield Barracks, and evaluates all potential economic conservation opportunities (ECO's). The scope of work for this project is included in Appendix C-1 and is summarized as follows:

1) Review for general information the previously completed Energy Engineering Analysis Program (EEAP) study and any other energy studies which were performed at this installation.
2) Reevaluate selected projects and energy conservation opportunities (ECO's) from previous studies to determine their economic feasibility based on revised criteria, current site conditions and technical applicability.
3) Evaluate selected ECO's to determine their energy savings potential and economic feasibility.
4) Perform a limited site survey of selected buildings or areas to insure that any methods of energy conservation which are practical and have not been evaluated in any energy study have been considered and the results documented.
5) Provide complete programming or implementation documentation for all recommended ECO's.
6) Prepare a comprehensive report to document the work performed, results and recommendations.

The family quarters included in this study consists of 22 different

family housing unit types with a combined total of 758 units. The floor plans for a number of different units are virtually identical and have been treated as similar units in the study. Therefore, for the purposes of analysis there are effectively only 15 different quarter types. Floor plans for all the unit types surveyed are shown in Appendix D.

The only energy source currently used in the family housing quarters is electrical. No central air conditioning is provided for any of the housing types and it is estimated that less than 10% of the residents have installed their own air conditioning units. All existing built-in space heating units have been disabled and are currently inoperable.

II. Energy Field Survey:

An energy survey of existing conditions in each different housing unit type was conducted from January 8, 1990 to January 25, 1990. The data collected during this survey, including measurements of lighting levels, hot water temperatures and a survey of equipment & light fixtures, appears in Appendix E. Maps showing the areas included in this project are shown in Figures 1 - 3. Arrangements were made through the Oahu Consolidated Family Housing Office (OCFHO) to schedule field visits to a selected number of each unit type. The survey schedule included sixteen units of each type with only the first six units open to inspection to be actually surveyed. It was believed that this ratio would be adequate to obtain the required minimum of six surveyed units, but in practice the unit occupancy rate was much lower than anticipated. A summary of the number of homes visited during the field survey is shown in Table 1.

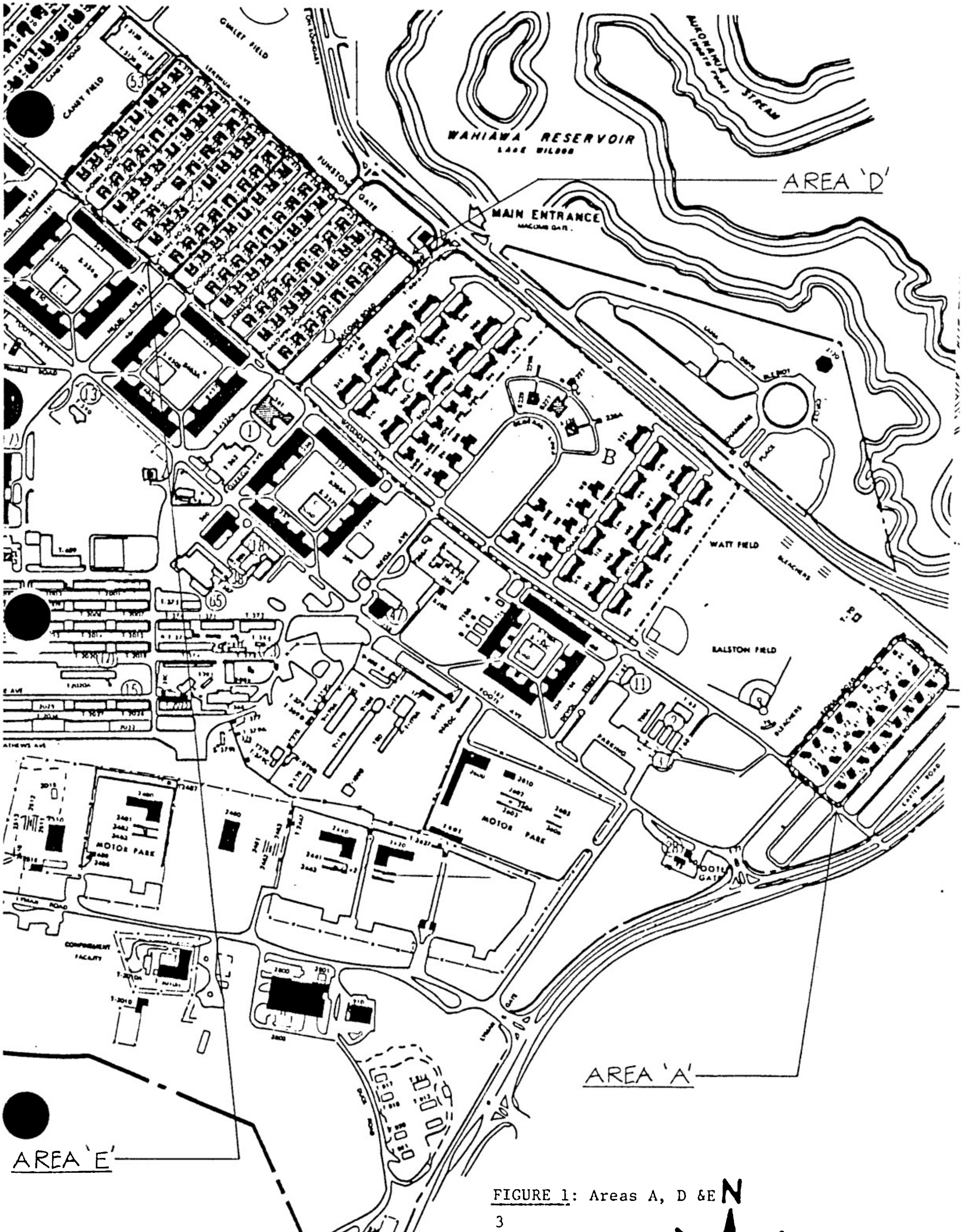

FIGURE 1: Areas A, D &E N

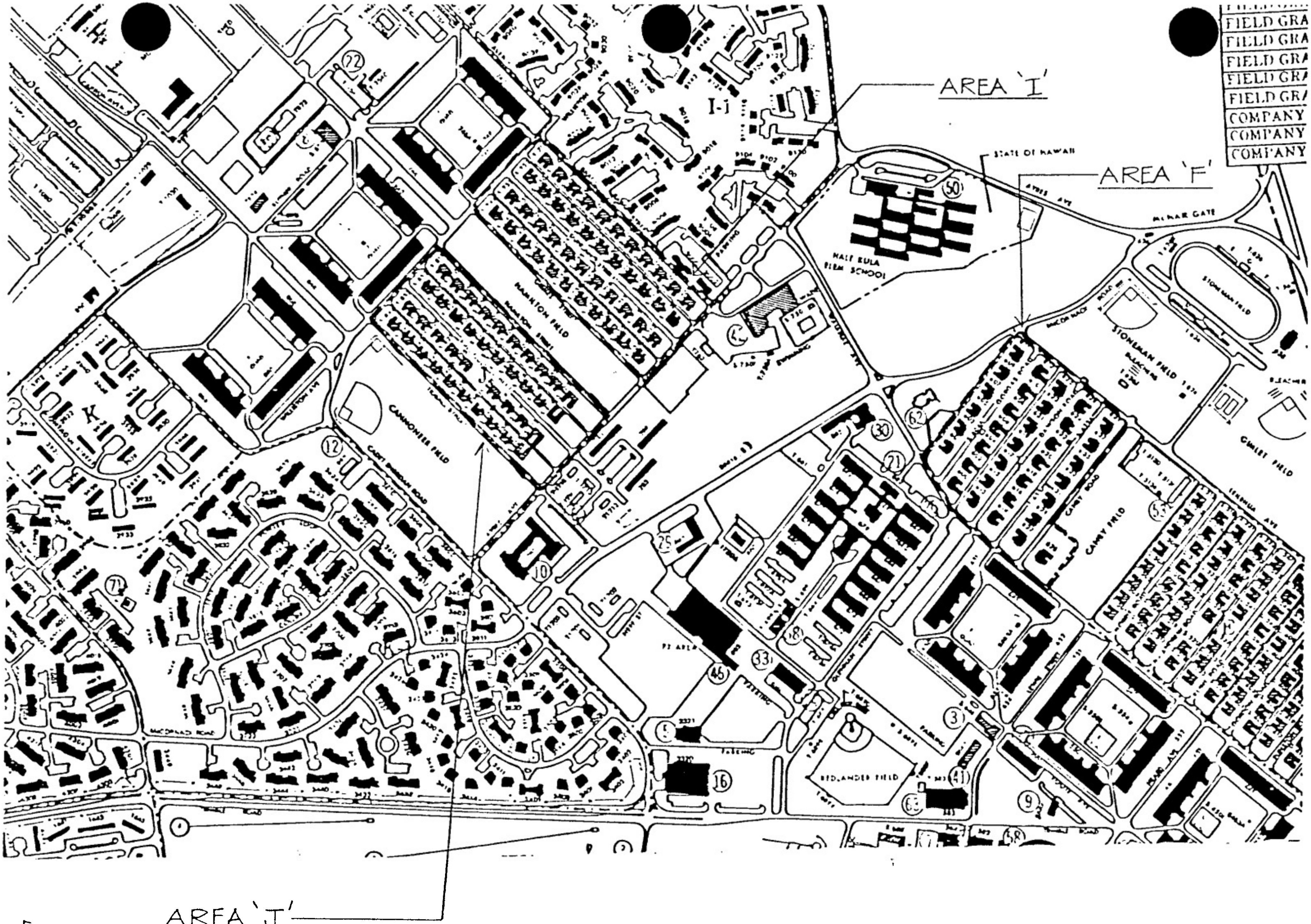

FIGURE 2: Areas I & J & F

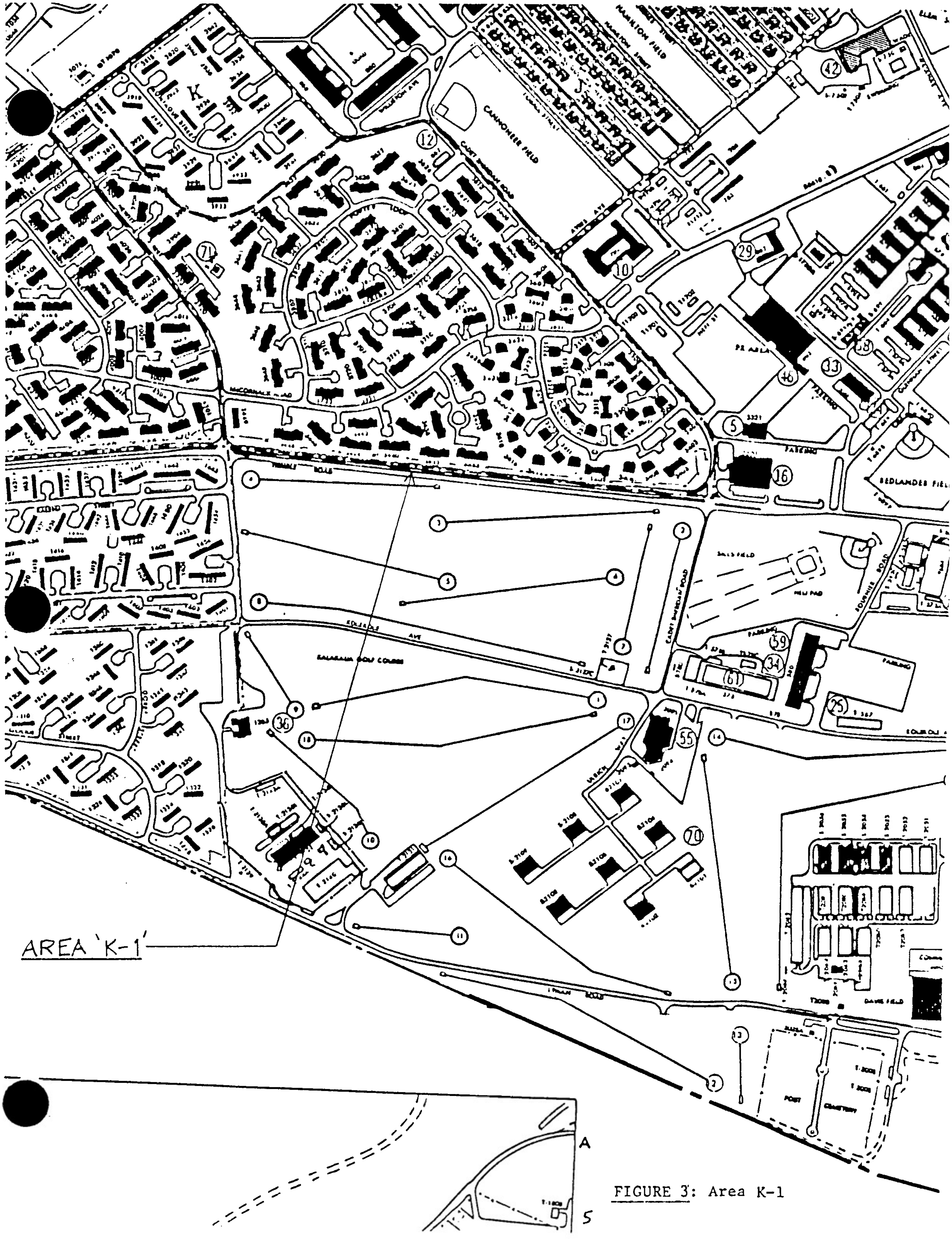

FIGURE 3: Area K-1

Table 1: Unit Type Data

UNIT TYPE	BASE AREA	NO. OF UNITS SURVEYED	NO. OF UNITS VISITED	TOTAL NO. OF UNITS IN THIS PROJECT
20-II	D, E, & I	4	14	14
20-III	D, E & I	4	18	122
20-IV	J	6	--	29
20-V	J	6	--	14
20-VI*	E	0	1	1
32-I	A	6	--	11
32-II	A	4	11	11
32-III	F	4	22	26
32-IV	F	4	9	9
57-I	D, I & J	3	8	8
57-II	K-1	6	--	68
57-III	K-1	5	16	20
57-IV	K-1	6	--	136
57-V	K-1	6	--	102
57-VI	K-1	6	--	24
57-VII	K-1	4	6	6
57-VIII	K-1	6	--	24
57-IX	K-1	4	16	16
60-I	K-1	6	--	20
60-II	K-1	6	--	16
60-III	K-1	6	--	76
71-I	A	4	5	5
TOTALS		106		758

* This unit was visited three times but the occupants were not home on all occasions.

<u>Notes</u>:

1. The following Unit Types have floor plans that are indisinguishable from one another and have been treated in the analysis as similar units.

   Unit Types:

   a) 32-I and 32-II
   b) 57-II, 57-IV, 57-VI, 57-VIII & 57-IX
   c) 57-II and 57-VII

III. Present Energy Consumption and Costs:

A single primary transmission line from Hawaiian Electric Company (HECO) is brought into Schofield Barracks and submetered into various areas throughout the base. Electricity is purchased on a rate schedule "P" for large commercial power users. The Directorate of Facilities Engineering (DFE) monitors the base electrical meters and bills on-base customers at an average rate of $0.068/KWH. The actual average rate that Schofield Barracks purchases energy from HECO is $0.056/KWH.

An analysis of energy consumption by unit type is not possible due to the fact that there is no metering of individual housing quarters. Metering is only done on an area by area basis, and each area encompasses a variety of different unit types. Thus, only average household energy consumptions for the study as a whole will be considered.

The OCFHO electrical bills for the months between 1/89 and 2/90 (inclusive) were obtained from the DFE. A copy of these bills is included in Appendix C-2. Examination of these records and discussion with the base electrical maintenance shop personnel indicates that the current monitoring of electrical meters is insufficient to determine the exact energy usage for all the areas under consideration. The DFE billings for the family housing energy usage do not appear to account for and correspond with all the areas included in this study. Specifically, billings and electric meter readings do not include housing areas A, D, E, F, I, and J. Additionally, it appears that the

meters monitored by the DFE includes street lighting, and in some cases may also include loads from non-housing occupancies.

From the areas currently monitored by the DFE, the only housing area contained in the billing that corresponds to an area included in this study is Area K-1. If the street lighting loads are subtracted out, assuming 100 watt bulbs and 12 hours of operation, and it is further assumed that there are no other non-housing loads on this meter; the average household energy consumption for Area K-1 is estimated to be 1,623 KWH/month.

Based on the assumption that the energy usage in area K-1 is fairly representative, the current annual energy consumption for all 758 homes included in this study is approximately 14,762,800 KWH/Yr or 50,390 MBTU/Yr. This amounts to a current annual total cost for electricity of $1,003,870/Yr based on an electrical rate of $0.068/KWH.

The basewide average electrical consumption for this same time period was 10,410,700 KWH/month or 426,400 MBTU/year. It is estimated that the family housing areas under consideration thus accounts for approximately 12% of the total base electrical usage.

In order to determine a more accurate baseline energy consumption, more data is required from the DFE. Details regarding the non-residential loads measured on the monitored housing meters, and the exact base areas each meter feeds is needed.

IV. Historical Energy Consumption

Based on the energy usage in Area K-1, it appears that between 1988 and 1989 the average household energy consumption increased from 1,275 KWH/month to 1,623 KWH/month, constituting a 28% rise. In comparison, the total base electrical usage only increased by 4.4% from 9,970,667 KWH/month to 10,410,667 KWH/month during the same time period. Monthly electrical energy consumption for the average family housing unit and for the base at large is shown graphically in Figures 4-5.

V. Energy Conservation Opportunity (ECO) Analysis and Recommendations:

All reasonable energy conservation opportunities were analyzed for feasibility and energy savings potential. A tabular summary of the analysis for all unit types is included in Table 2. For summaries by individual unit types see Appendix B. The feasible ECO's identified in the study are listed in Table 3, and are summarized as follows:

1) Replace/Repair Broken Domestic Hot Water Heat Pumps: All the unit types included in this study have existing hot water heat pumps, but during our field survey it was found that approximately 20% of the heat pumps in place were broken and have been bypassed. The heat pumps currently installed are manufactured by Fedders. Separate analyses were performed to compare the economic feasibility of heat pump repair versus replacement. The repair option was found to be much more cost effective resulting in an annual savings of $78,382 with an SIR of 6.23 and a payback period

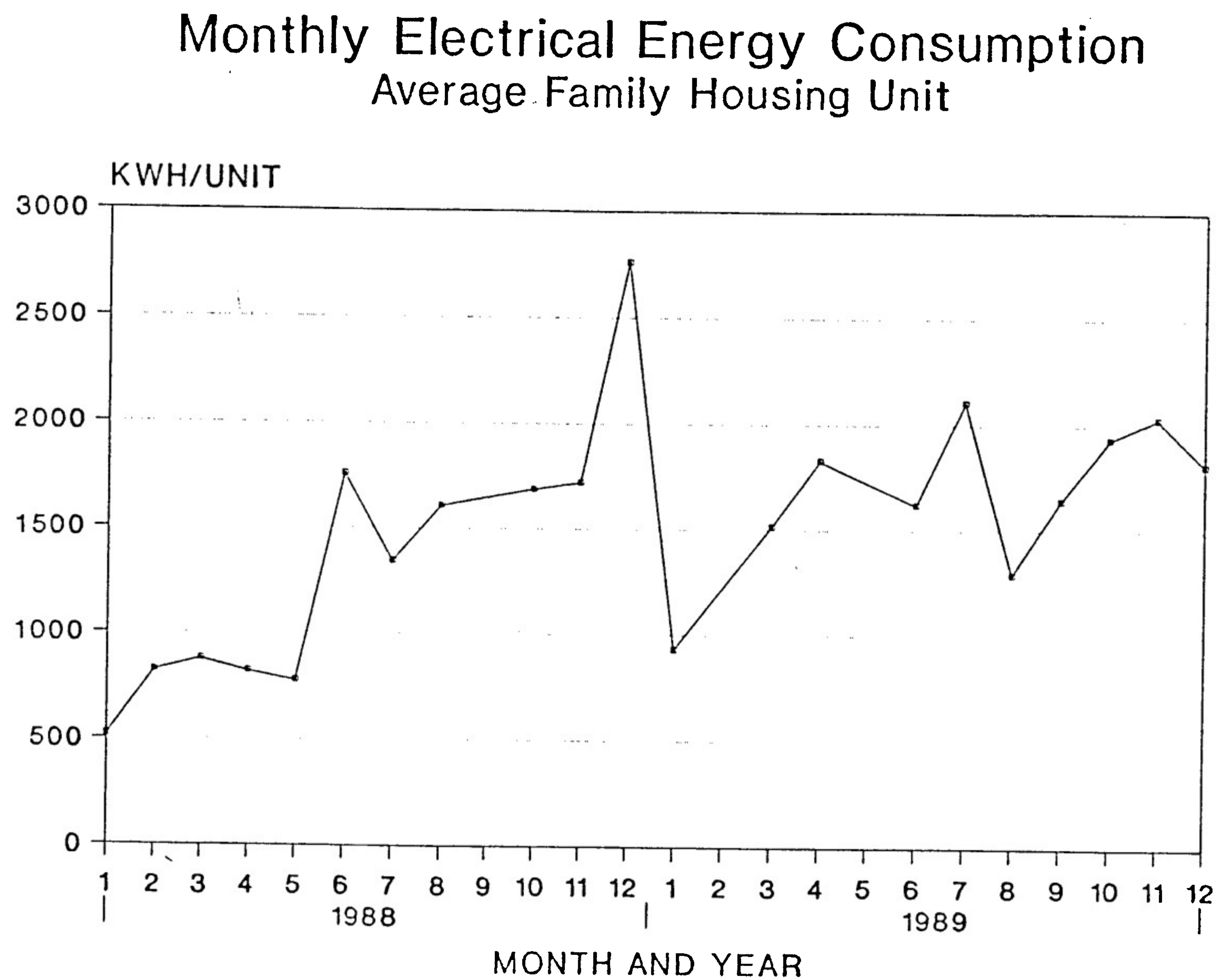

Figure 4: Family Housing Electrical Consumption

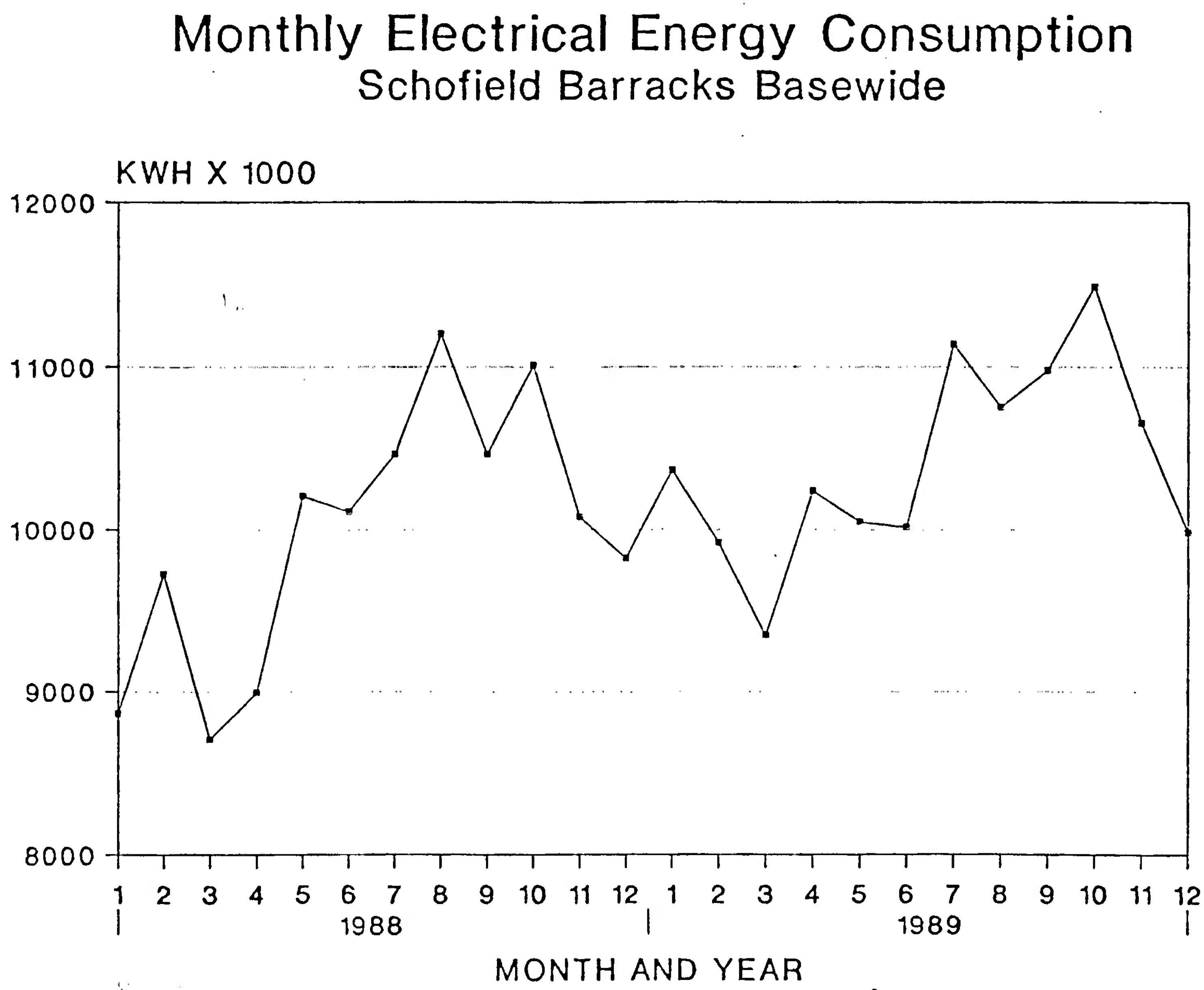

Figure 5: Overall Base Electrical Consumption

TABLE 2: SUMMARY OF ENERGY CONSERVATION OPPORTUNITIES FOR TOTAL PROJECT

		ANNUAL ELECTRICAL ENERGY SAVINGS MBTU	ANNUAL COST SAVINGS	ESTIMATED CONSTRUCTION COST	SIMPLE PAYBACK YEARS	SIR
1.	Insulation					
1.1	Insulation of Roof, Walls, etc.	----	----	----	----	----
1.2	Insulation of Piping	0.0038/LF	$0.26/LF	$3.75/LF	14.4	0.81
2.	Exterior Building Envelope					
2.1	Weather Stripping & Caulking	----	----	----	----	----
2.2	Vestibles	----	----	----	----	----
2.3	Loading Dock Seals	----	----	----	----	----
2.4	Reduction of Glass Area	----	----	----	----	----
2.5	Low Emissivity Windows	----	----	----	----	----
2.6	Water Spray Roof Cooling	----	----	----	----	----
2.7	Solar Film	----	----	----	----	----
3.	Lighting					
3.1	Reduce Lighting Levels	----	----	----	----	----
3.2	Replace Incadescent Lights	1,852	$36,898	$221,542	6.0	1.94
3.3	Energy Conserving Fluorescent Light & Ballast	64.194	$ 1,278	$140,549	110	0.11
3.4	Replace Kitchen Light Fixtures	(Combined w/ 3.3)				
3.5	Use More Energy Efficient Lighting Source	(Combined w/ 3.2)				
3.6	Reflectors for Fluorescent Fixtures	----	----	----	----	----
3.7	Occupancy Sensors to Control Lighting	----	----	----	----	----
3.8	Separate Switches to Control Lighting	----	----	----	----	----
3.9	Reduce Street Lighting	----	----	----	----	----
4.	Hot Water					
4.1	Control Hot Water Circulation Pump	----	----	----	----	----
4.2	Heat Reclaim from Family Housing Condenser...	----	----	----	----	----
4.3	Reclaim Heat from Hot Refrigerant Gas	----	----	----	----	----
4.4	Instantaneous Hot Water Heaters	5.810/unit	$38.56/unit	$1480/unit	36.9	0.11
4.5	Decentralize Domestic Hot Water Heaters	(Combined w/ 4.3)				
4.6	Install Shower Flow Restrictors/ Limited Flow Showerheads	----	----	----	----	----
4.7	Repair Broken Domestic Hot Water Heat Pumps	3,934	$78,382	$40,878	0.52	6.23

4.8 Install Timeclocks	----	----	----	----	----
4.9 Shutdown Energy to Hot Water Heater or Modify Controls	----	----	----	----	----
5. Electrical System					
5.1 Improve Power Factor	----	----	----	----	----
5.2 Transformer Overvoltage	----	----	----	----	----
5.3 Transformer Loading	----	----	----	----	----
6. HVAC System					
6.1 Economizer Cycles (DB)	----	----	----	----	----
6.2 Radiator Controls	----	----	----	----	----
6.3 FM Radio Controls	----	----	----	----	----
6.4 Chiller Replacement	----	----	----	----	----
6.5 Chiller Controls	----	----	----	----	----
6.6 Replace Absorption Chiller	----	----	----	----	----
6.7 Boiler Oxygen Trim Control (Fixed or Portable)	----	----	----	----	----
6.8 Revise Boiler Controls	----	----	----	----	----
6.9 Insulate Steam & Condensate Lines	----	----	----	----	----
6.10 Waste Heat Recovery	----	----	----	----	----
6.11 Thermal Storage	----	----	----	----	----
6.12 Steam Trap Inspection	----	----	----	----	----
6.13 Revise or Repair Building HVAC Controls	----	----	----	----	----
6.14 Night Setback/Setup Thermostats	----	----	----	----	----
6.15 Infrared Heaters	----	----	----	----	----
6.16 Air Curtains	----	----	----	----	----
6.17 Prevent Air Stratification	----	----	----	----	----
6.18 Reduce Airflows	----	----	----	----	----
6.19 High Efficiency Motor Replacement	----	----	----	----	----
7. Motor/Equipment					
7.1 High Efficiency Motor Replacement	----	----	----	----	----

TABLE 3: SUMMARY OF FEASIBLE ECO'S FOR TOTAL PROJECT

		ANNUAL ELECTRICAL ENERGY SAVINGS MBTU	TOTAL ANNUAL COST SAVINGS	ESTIMATED CONSTRUCTION COST	SIMPLE PAYBACK YEARS	SIR
*1.	Repair Broken Domestic Hot Water Heat Pumps	3,934	$78,382	$40,878	0.52	6.23
2.	Replace Incadescent Lights	1,852	$36,898	$221,542	6.0	1.94
3.	Insulation of Piping	0.0038/LF	$0.26/LF	$3.75/LF	14.4	0.81
4.	Instantaneous Hot Water Heaters	5.810/UNIT	$38.56/UNIT	$1,424/UNIT	36.9	0.11
5.	Energy Conserving Fluorescent Light & Ballast	64.19	$1,278	$140,549	110	0.11

* Assuming that 20% of the existing heat pumps are not operable

of 0.52 years, whereas the replacement alternative provided a SIR of 2.73 and a payback period of 3.3 years.

In the course of this study it was found that the OCFCO currently has a maintenance and repair project, now in the pre-award stage, to fix and maintain all HW heat pumps throughout the base housing. These plans coincide with our recommendation to implement a repair project for the broken heat pumps.

2) <u>Replace Incandescent Lights</u>: Existing incandescent lamps can be replaced with energy saving fluorescent adapters. This modification would reduce energy costs by $36,898/year, for a resulting simple payback of 6.0 years and a SIR of 1.94. Fluorescent adapters are normally larger than their incandescent bulb counterparts, but ultra short double tube models are available that should be able to fit within the majority of existing luminaries. This study only included a limited site survey so we cannot confirm the exact number of lamps which can be replaced, but we estimate that the adapters will fit in approximately 70% of the existing fixtures. The estimated energy cost reduction shown above reflects this 70% diversity factor. Regardless of the actual number of lamps which are replaced the overall payback and SIR for this ECO will remain the same due to the proportional reduction in construction costs.

3) <u>Insulation of HW Piping</u>: The insulation of exposed HW piping in easily accessible areas would cost $3.75/LF to install and would

produce an annual cost savings of $0.26/LF. This calculates to a simple payback of 14.4 years and a SIR of 0.81 which would not make this project cost effective. It thus follows that the insulation of piping in inaccessible areas would also not be cost effective.

4) Instantaneous Hot Water Heaters: To reduce heat losses through long runs of HW piping and the HW storage tank, instantaneous heaters could be installed at each location that hot water is required. Analysis for the longest run of piping (assumed to be uninsulated) shows that energy savings from this item would be $38.56/unit. An estimated construction cost of $1,480/unit with a payback period of 36.9 years and a SIR of 0.11 makes this project non-cost effective.

5) Energy Conserving Fluorescent Lights & Ballast: Existing fluorescent lights can be replaced with energy conserving type of fluorescent fixtures. This project would present a cost savings of $1,278/year with a non-cost effective payback period of 110 years and a SIR of 0.11.

VI. Recommendations:

Based on our ECO analysis, we recommend that the following projects be implemented to reduce energy consumption:

		Energy Savings (MBTU/YR)	Cost Savings ($/Yr)	% Savings	Project Type
1.	Repair Broken Heat Pumps	3,934	78,382	7.8	N/A
2.	Replace Incandescent Lights	1,852	36,898	3.7	Low Cost
	Total	5,786	115,280	11.5	

Implementation of these projects would reduce energy usage by a total of 5,786 MBTU/Yr or a 11.5% reduction in current energy consumption, with an accompanying energy cost reduction of $115,280/Yr or a 11.5% decrease in annual energy expenditures. The projected energy and cost savings are shown graphically in Figures 6-7.

In addition to the implementation of the two ECO's above, we also recommend that the base metering system be upgraded and reorganized such that the electrical energy consumption in the housing area can be monitored more effectively. In the existing system there is no metering of individual housing quarters, metering is only done on an area by area basis, with a variety of different unit types included in each area. Furthermore, descriptions from DFE personal indicates that industrial and street lighting loads may also be included on the area meters along with the housing loads. We were unable to obtain drawings detailing the meter circuiting and the DFE was unable to give us a description of the exact buildings which are monitored by each meter. Additionally, several of the meters are broken, so monitoring in some areas has not been done for an extended period of time. In examining the base electrical billings for the family housing areas, we were unable to

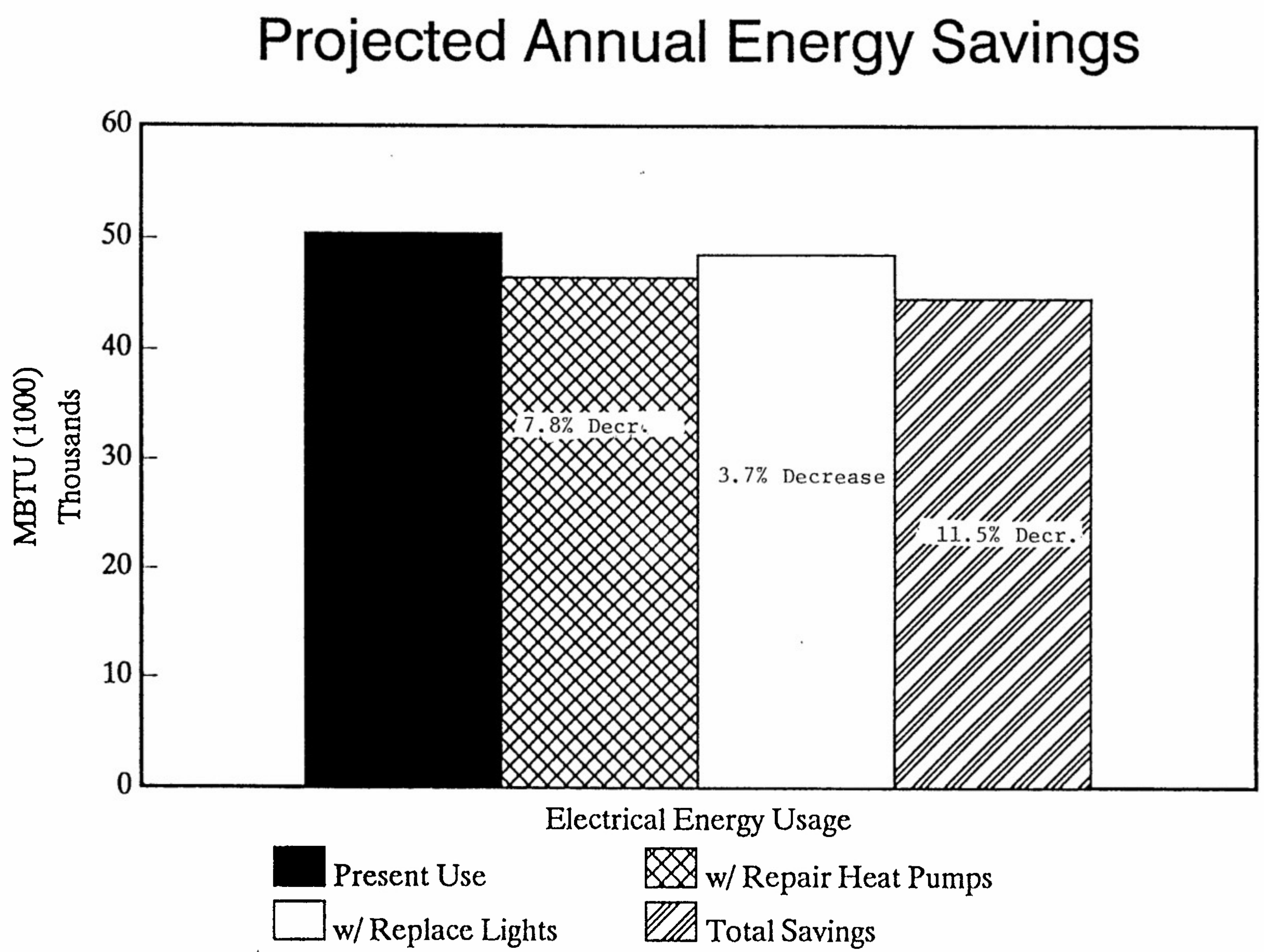

Figure 6: Projected Energy Savings with Recommended ECO's

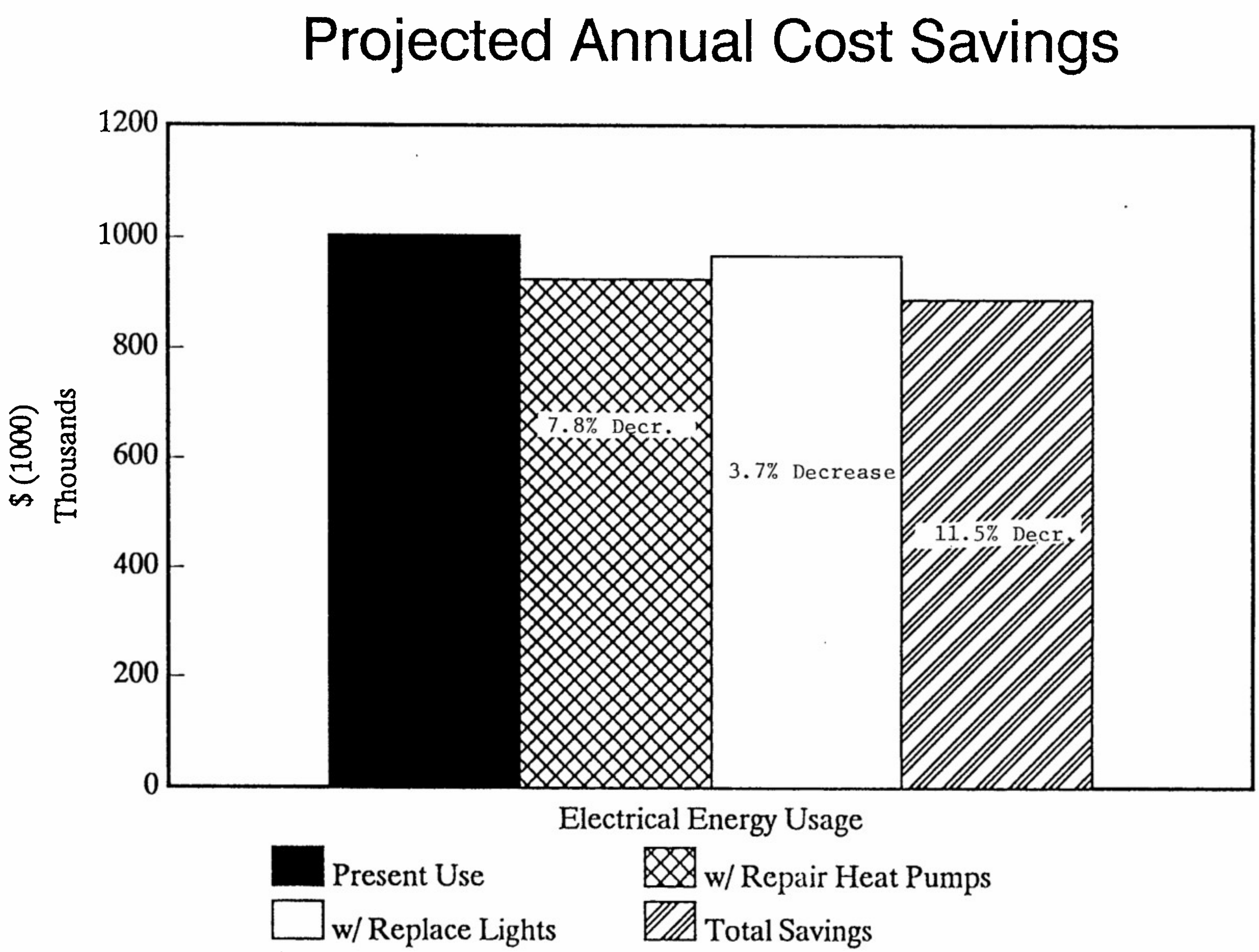

Figure 7: Projected Cost Savings with Recommended ECO's

correspond the meter readings to all the family housing areas under investigation. In order to get a baseline electrical consumption history we needed to extrapolate data from the monitored energy usage in one housing area only.

In order to effectively monitor the family housing energy consumption and to observe energy reductions resulting from the implemented ECO's, the base metering system must be improved. The DFE should reexamine the existing system and determine the specific loads monitored by each meter. If possible it would be beneficial to separate the housing loads from the industrial and street lighting loads through deductive metering. It would also be helpful to have individual metering of each housing unit in order to keep the residents aware of energy usage. However, this may be costly to implement and it is difficult to quantify the energy savings that could be obtained from such a plan.

VII. Programming Documents:

Low cost project documentation for the project "Replace Incandescent Lights" is included in Appendix E.

A project implemented by the OCFHO to repair and maintain the family housing heat pumps is already in the pre-award stage and, as such, no programming documentation is required for this ECO.

1. Insulation

1.1 Roof, Wall, Ceiling, Glass, Duct, Panel Insulation

The units under analysis in this study do not have existing central air conditioning systems. Building envelope insulation is not applicable.

1.2 Piping Insulation

a. Unit Types 57-I, 20-V:

Not applicable. These units have existing 1" thick unicellular insulation on the HW piping.

b. Unit Types: 20-II, 20-III, 20-IV, 20-VI

1. Existing Condition: The existing piping is not insulated, but is easily accessible in the crawl space beneath the units' raised floors.

2. Assumptions:

a) $h_{air} = 0.5$ BTU/Hr-SF for pipe in still air

b) $h_f = 1{,}000$ BTU/Hr for water

c) $k = 0.0208$ for fiberglass insulation

d) Average Air Temperature = 75°F

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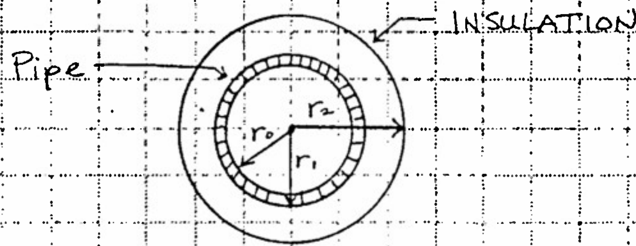
Telephone (808) 847-6557 Telefax: (808) 847-6550

DATE: JOB No.:
PROJECT NAME: BY:
SUBJECT:

e) Exist Heat Pumps COP = 3.0
f) $K = 223\ ^{BTU}/_{Hr-Ft-F}$ for Copper



$$\sum \frac{R}{L}_{exist} = \left[\frac{1}{h_f r_0} + \frac{\ln (r_1/r_0)}{K_{pipe}} + \frac{1}{h_{air} r_1} \right] \frac{1}{2\pi}$$

$$\sum \frac{R}{L}_{w/insul} = \left[\frac{1}{h_f r_0} + \frac{\ln (r_1/r_0)}{K_{pipe}} + \frac{\ln (r_2/r_1)}{K_{insul}} + \frac{1}{h_{air} r_2} \right] \frac{1}{2\pi}$$

$$\theta = \frac{\Delta T}{\sum R} \longrightarrow \frac{\theta}{L} = \frac{\Delta T}{\sum R/L}$$

3. Evaluate Heat loss:

Check 3/4" pipe w/ 1" insulation for worst case heat loss for all unit types.

$$\sum \frac{R}{L}_{exist} = \left[\frac{1}{1000\,(.785/12)} + \frac{\ln (.875/.785)}{223} + \frac{1}{0.5\,(.875/12)} \right] \frac{1}{2\pi}$$

$$= 4.4$$

$$\sum \frac{R}{L} = \left[\frac{1}{1000\,(.785/12)} + \frac{\ln (.875/.785)}{223} + \frac{\ln (1.875/.875)}{0.0208} + \frac{1}{0.5\,(1.875/12)} \right] \frac{1}{2\pi}$$

$$= 7.9$$

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SUBJECT:	Sht. 1-2 Of

$$Q/L_{exist.} = \frac{(120 - 75F)}{4.4} = 10.2\ BTU/HR-FT$$

$$Q/L_{w/ins.} = \frac{(120 - 75F)}{7.9} = 5.7\ BTU/HR-FT$$

Reduction in heat loss = $(10.2 - 5.7) = 4.5\ BTU/HR-FT$

ANNUAL ENERGY SAVINGS

$$= (4.5\ BTU/HR\text{-}FT)(24\ hr/day)(365\ day/yr) = 39,420\ BTU/yr\text{-}FT$$

OR

$$\frac{39420\ BTU/yr\text{-}ft}{(3.413\ BTUH/W)(3.0)} = 3.8\ KWH/ft\text{-}yr$$

ANNUAL COST SAVINGS

$$= (3.8\ KWH/ft\text{-}yr)(\$0.068\ /KWH) = \$0.26$$

Cost for insulation (see attached) = \$ 3.75

$$\text{Payback} = \frac{\$\ 3.75}{\$\ 0.26\ /yr} = 14.4\ years$$

SIR = 0.81 (see attached)

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SUBJECT: Sht. 1-3 Of

PRO ADD HW INSULATION TO ACCESSIBLE PI | ESTIMATOR | CHECKED BY | SHEET OF SHEETS

TASK DESCRIPTION	QUANTITY		LABOR				EQUIPMENT		~~MATERIAL~~ Engineering		TOTAL
	NO. OF UNITS	UNIT MEAS	MH/UNIT	TOTAL HRS	UNIT PRICE	COST	UNIT PRICE	COST	UNIT PRICE	COST	
3/4" ϕ, 1" Thick Fiberglass	1	LF							3.75	3.75	3.75
Insulation w/ all											
service jacket											
								TOTAL	=		3.75/LF
NOTE :											
① UNIT PRICES TAKEN FROM MEANS MECHANICAL COST DATA, 1989 ed.											

DA FORM 5418-R, Apr 85 CONTD

LIFE CYCLE COST ANALYSIS SUMMARY
ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP)

LOCATION: ______ REGION NO. ____ PROJECT NUMBER ______

PROJECT TITLE ADD HW INSULATION TO ACCESSIBLE PIPES FISCAL YEAR ______

DISCRETE PORTION NAME ______

ANALYSIS DATE ______ ECONOMIC LIFE 25 YEARS PREPARED BY ____

1. INVESTMENT COSTS
   - A. CONSTRUCTION COST $ 3.75 / LF
   - B. SIOH (5.5%) $ 0.21
   - C. DESIGN COST (10%) $ 0.38
   - D. ENERGY CREDIT CALC (1A+1B+1C)X.9 $ 3.91 / LF
   - E. SALVAGE VALUE OF EXISTING EQUIPMENT $ —
   - F. TOTAL INVESTMENT (1D-1E) $ 3.90 / LF

2. ENERGY SAVINGS (+) / COST (-)
   ANALYSIS DATE ANNUAL SAVINGS, UNIT COST $ DISCOUNTED SAVINGS

FUEL	COST $/MBTU(1)	SAVINGS MBTU/YR(2)	ANNUAL $ SAVINGS(3)	DISCOUNT FACTOR(4)	DISCOUNTED SAVINGS(5)
A. ELEC	$ 68.42	.0038/LF	$ 0.26	12.12	$ 3.15
B. DIST	$		$		$
C. RESID	$		$		$
D. NG	$		$		$
E. COAL	$		$		$
F. TOTAL			$ 0.26		$ 3.15

3. NON ENERGY SAVINGS (+) / COST (-)
   - A. ANNUAL RECURRING (+/-) $ 0
     - (1) DISCOUNT FACTOR (TABLE 1) ______
     - (2) DISCOUNTED SAVING/COST (3A X 3A1) $ 0
   - B. NON RECURRING SAVINGS (+) / COST (-)

ITEM	SAVINGS $ (+) COST $ (-)(1)	YEAR OF OCCURRENCE(2)	DISCOUNT FACTOR (3)	DISCOUNTED SAVINGS (+) COST(-)(4)
a.	$			$
b.	$			$
c.	$			$
d. TOTAL	$			$

   - C. TOTAL NON ENERGY DISCOUNTED SAVINGS (+) / COST (-) (3A2+3Bd4) $ 0
   - D. PROJECT NON ENERGY QUALIFICATION TEST
     - (1) 25% MAX NON ENERGY CALC (2F5 X .33) $ 1.04
       - a. IF 3D1 IS = OR 3C GO TO ITEM 4
       - b. IF 3D1 IS 3C CALC SIR = (2F5+3D1) : 1F = ______
       - c. IF 3D1b IS = 1 GO TO ITEM 4
       - d. IF 3D1b IS 1 PROJECT DOES NOT QUALIFY

4. FIRST YEAR DOLLAR SAVINGS 2F3+3A+(3B1d : YEARS ECONOMIC LIFE) $ 0.26
5. TOTAL NET DISCOUNTED SAVINGS (2F5+3C) $ 3.15
6. SIR (IF 1 PROJECT DOES NOT QUALIFY) (SIR)=(5 : 1F)= 0.81

1-5

c. All other Unit Types

The existing hot water piping for all other unit types included in this study are not insulated and are buried in the conc. slab or made otherwise inaccessible. Insulating these lines would necessitate rerouting all the HW piping above ground and would not be a practical option, since it was previously shown that the insulation of even accessible piping is not cost effective.

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PROJECT NAME:	BY:
SUBJECT:	Sht. 1-6 Of

2. Exterior Building Envelope

2.1 Weather Stripping and Caulking

Not applicable for all unit types in this study. None of the units have a central air conditioning system, so infiltration or exfiltration of air will not cause energy losses.

2.2 Vestibles

Not applicable for all unit types in this study. The units do not have central air conditioning so entering outside air is not a problem.

2.3 Loading Dock Seals

Not applicable. No units have loading docks.

2.4 Reduction of Glass Area

Not applicable for all unit types in this study. The units do not have central air conditioning, so reducing the heat gain from fenestration area will not cut energy usage.

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DATE:	JOB No.:
PROJECT NAME:	BY:
SUBJECT:	Sht. 2-1 Of

2.5 Low Emissivity Window

Not applicable for all units in this study. The units do not have central air conditioning systems so reduction of heat gain through the windows will not lower energy usage.

2.6 Water Spray Roof Cooling

Not applicable for all units in this study. The units do not have central air conditioning systems, so reduction of roof heat gain will not lower energy usage.

2.7 Solar Film

Not applicable for all units in this study. The units do not have central air conditioning systems, so reduction of heat gain thru the windows does not effect energy usage.

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PROJECT NAME: BY:
SUBJECT:

3. Lighting

3.1 Reduce Lighting Levels

1. Comparison of measured vs. recommended lighting levels:

Unit TYPE	Location	Avg. Measured (FC)	*Recommended (FC)
20-II	L/R	3	10
	D/R	6	10
	B/R 1	3	10
	B/R 2	4	10
	B/R 3	3	10
	B/R 4	3	10
	B/R 5	6	10
	B/R 6	3	10
	KIT.	4	20
	LAUNDRY	4	20
	PANTRY	6	10
	BATH 1	8	20
	BATH 2	8	20
	LANAI	3	10
20-III	L/R	2	10
	D/R	6	10
	B/R 1	6	10
	B/R 2	3	10
	B/R 3	4	10
	B/R 4	5	10
	B/R 5	8	10
	KIT.	5	20
	LAUNDRY	5	20
	PANTRY	5	10

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BY:
SUBJECT:

UNIT TYPE	LOCATION	Avg. Measured (FC)	*Recommeded (FC)
	Bath	14	20
	Toilet	4	20
	Lanai	2	10
20-IV	L/R	7	10
	D/R	5	10
	B/R 1	3	10
	B/R 2	3	10
	B/R 3	4	10
	B/R 4	5	10
	KIT.	19	20
	LAUNDRY	6	20
	BATH 1	5	20
	BATH 2	5	20
	LANAI	6	10
20-V	L/R	2	10
	D/R	6	10
	B/R 1	4	10
	B/R 2	3	10
	KIT.	30	20
	LAUNDRY	5	20
	BATH	15	20
	TOILET	6	20
	LANAI	2	10
32-I	L/R	13	10
	B/R 1	10	10
	B/R 2	10	10
	BATH	28	20
	KIT.	32	20
	LAUNDRY	20	20

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JOB No.:
PROJECT NAME:
BY:
SUBJECT:
Sht. 3-2
Of

UNIT TYPE	LOCATION	AVG MEASURED (FC)	*RECOMMENDED (FC)
32-II	same as 32-I		
32-III	L/R	5	10
	D/R	10	10
	B/R 1	2	10
	B/R 2	5	10
	B/R 3	2	10
	MAID'S	4	10
	BATH 1	13	20
	BATH 2	6	20
	KIT.	8	20
	LAUNDRY	8	20
	LANAI 1	5	10
	LANAI 2	6	10
32-IV	L/R	5	10
	D/R	8	10
	B/R 1	3	10
	B/R 2	4	10
	B/R 3	4	10
	B/R 4	4	10
	MAID'S	5	10
	BATH 1	8	20
	BATH 2	6	20
	KIT.	5	20
	LAUNDRY	7	20
	LANAI 1	2	10
	LANAI 2	4	10

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SUBJECT: Sht. 3-3 Of

UNIT TYPE	LOCATION	AVG MEASURED (FC)	*RECOMMENDED (FC)
57-I	L/R	5	10
	D/R	4	10
	B/R 1	3	10
	B/R 2	3	10
	BATH	9	20
	KIT.	8	20
	LAUNDRY	7	20
57-II	L/R	9	10
	B/R 1	5	10
	B/R 2	5	10
	B/R 3	5	10
	TOILET	7	20
	BATH	7	20
	KIT.	25	20
	LAUNDRY	5	20
57-III	L/R	4	10
	B/R 1	3	10
	B/R 2	3	10
	B/R 3	3	10
	BATH	22	20
	TOILET	9	20
	KIT.	27	20
	LAUNDRY	5	20

57-IV Same as Unit Type 57-II

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SUBJECT:

UNIT TYPE	LOCATION	AVG. MEASURED (FC)	*Recommended (FC)
57-V	L/R	9	10
	B/R 1	3	10
	B/R 2	3	10
	BATH	20	20
	TOILET	9	20
	KIT.	28	20
	LAUNDRY	8	20
57-VI	same as Unit Type 57-II		
57-VII	same as Unit Type 57-V		
57-VIII	same as Unit Type 57-II		
57-IX	same as Unit Type 57-II		
60-I	L/R	5	10
	B/R 1	5	10
	B/R 2	5	10
	BATH	21	20
	KIT.	32	20
60-II	L/R	7	10
	B/R 1	5	10
	B/R 2	5	10
	B/R 3	5	10
	B/R 4	5	10
	BATH	39	20
	TOILET	18	20
	KIT.	26	20

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PROJECT NAME: BY:

SUBJECT: Sht. 3-5 Of

UNIT TYPE	LOCATION	AVG MEASURED (FC)	*RECOMMENDED (FC)
60-III	L/R	6	10
	B/R 1	4	10
	B/R 2	4	10
	B/R 3	4	10
	BATH	15	20
	TOILET	23	20
	KIT.	26	20

* Lower end of IES recommended range of illumination, IES 1987 Application Volume, figure 2-1

2. The above comparison shows that the existing lighting levels throughout the units is already inadequate for the majority of rooms. Reduction of lighting levels is not a viable option.

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PROJECT NAME: BY:
SUBJECT:

3.2 Replace Incadescent Lighting

1. Assumptions:

a. Incadescent lamps will be replaced with energy saving fluorescent retrofit adaptors (ballast & lamp) that can be utilized in the existing incadescent fixtures.

b. Existing lighting levels will be increased to levels recommended by the Illuminating Engineering Society (IES) per Milhandbk 1190. If this cannot be achieved using the existing fixtures, lighting levels will just be increased as high as possible.

c. New fluorescent adaptors will have the following energy usage:

ADAPTOR SYSTEM WATTAGE	LUMENS	INCADESCENT EQUIV. WATTAGE
7	250	25
9	400	40
11	600	60
15	900	75

2. Comparison of Energy Usage:

See following tables

UNIT TYPE	LOCATION	EXIST FIX. (W)	QUAN.	ENERGY USED	AREA (SF)	NEW FIXTURE (W)	QUAN.	ENERGY USED (W)	ENERGY SAVED (W)
20-II	L/R	60	2	60	85	11	2	22	38
		100	4	400	85	15	4	60	340
	D/R	100	4	400	80	15	4	60	340
	B/R 1	100	1	100	70	15	1	15	85
	B/R 2	100	1	100	48	15	1	15	85
	B/R 3	100	1	100	48	15	1	15	85
	B/R 4	100	1	100	53	15	1	15	85
	B/R 5	NO INCADESCENT FIXTURES							
	B/R 6	"	"		"				
	BATH 1	60	1	60	20	15	2	30	30
	BATH 2	100	2	200	20	15	1	15	185
	KIT.	75	1	75	50	15	2	30	45
	PANTRY	75	2	150	24	11	2	22	128
	LAUN.	75	2	150	28	15	1	15	135
	LANAI	75	1	75	80	15	1	15	60

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PROJECT NAME:
BY:
SUBJECT:
Sht. 3-7
Of

UNIT TYPE	LOCATION	EXIST. FIXT. (W)	QUAN.	ENERGY USED	AREA (SF)	NEW FIX (W)	QUAN.	ENERGY USED (W)	ENERGY SAVED (W)
20-III	L/R	75	1	75	80	15	1	15	60
	D/R	75	4	300	80	15	4	60	240
	B/R 1	75	2	150	42	15	2	30	120
	B/R 2	75	2	150	56	15	2	30	120
	B/R 3	75	2	150	60	15	2	30	120
	B/R 4	75	2	150	16	9	2	18	132
	B/R 5	75	2	150	16	9	2	18	132
	BATH	75	3	225	22	9	3	21	204
	TOILET	60	1	60	3	9	1	9	51
	KIT.	75	1	75	45	15	1	15	60
	LAUND.	75	1	75	30	15	1	15	60
	PANTRY	75	1	75	30	15	1	15	60
	LANAI	75	1	75	79	15	1	15	60

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PROJECT NAME:
BY:
SUBJECT:
Sht. 3-9
Of

UNIT TYPE	LOCATION	EXIST. FIXT. (W)	QUAN.	ENERGY USED	AREA (SF)	NEW FIX (W)	QUAN.	ENERGY USED (W)	ENERGY SAVED (W)
20-IV	L/R	75	3	225	90	15	3	45	180
	D/R	75	2	150	96	15	2	30	120
	B/R 1	75	2	150	45	15	2	30	120
	B/R 2	75	2	150	60	15	2	30	120
	B/R 3	75	2	150	49	15	2	30	120
	B/R 4	75	2	150	23	11	2	22	128
	BATH 1	75	1	75	22	15	1	15	60
	BATH 2	60	2	120	9	9	2	18	102
	KIT.	75	3	225	76	15	3	45	180
	LAUNDRY	100	1	100	23	15	1	15	85
	LANAI	75	5	375	60	11	5	55	320

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DATE: JOB No.:

PROJECT NAME: BY:

SUBJECT: Sht. 3-10 Of

UNIT TYPE	LOCATION	EXIST. FIXT. (W)	QUAN.	ENERGY USED	AREA (SF)	NEW FIX (W)	QUAN.	ENERGY USED (W)	ENERGY SAVED (W)
20-V	L/R	75	3	225	56	15	3	45	180
	D/R	75	2	150	49	15	2	30	120
	B/R 1	75	2	150	49	15	2	30	120
	B/R 2	75	2	150	28	11	2	22	128
	BATH	75	1	75	22	15	1	15	60
		100	1	100	22	15	1	15	85
	TOILET	75	2	150	7	9	2	18	132
	KIT.	75	2	150	30	15	2	30	120
	LAUND.	60	1	60	20	15	1	15	45
	LANAI	75	4	300	44	11	4	44	256

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JOB No.:

PROJECT NAME:

BY:

SUBJECT:

UNIT TYPE	LOCATION	EXIST. FIXT. (W)	QUAN.	ENERGY USED	AREA (SF)	NEW FIX (W)	QUAN.	ENERGY USED (W)	ENERGY SAVED (W)
20-VI	This unit was not seen. There is only 1 house of this Unit Type on the base and the occupants were out on the 3 occasions we attempted to survey it.								

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DATE: | JOB No.:
PROJECT NAME: | BY:
SUBJECT: | Sht. 3-12 Of

UNIT TYPE	LOCATION	EXIST. FIXT. (W)	QUAN.	ENERGY USED	AREA (SF)	NEW FIX (W)	QUAN.	ENERGY USED (W)	ENERGY SAVED (W)
32-I	L/R	60	1	60	300	15	1	15	45

Note: the rest of the house utilizes fluorescent type fixtures.

32-II This unit type has the same interior floor layout as 32-I. See above data.

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PROJECT NAME:		BY:
SUBJECT:		Sht. 3-13 Of

UNIT TYPE	LOCATION	EXIST. FIXT. (W)	QUAN.	ENERGY USED	AREA (SF)	NEW FIX (W)	QUAN.	ENERGY USED (W)	ENERGY SAVED (W)
32-III	L/R	75	3	225	92	15	3	45	180
	D/R	75	5	375	63	11	5	55	320
	B/R 1	75	3	225	56	15	3	45	180
	B/R 2	75	2	150	48	15	2	30	120
	B/R 3	75	3	225	56	15	3	45	180
	MAID'S	75	2	150	30	11	2	22	128
	BATH 1	60	1	60	20	15	1	15	45
	BATH 2	60	1	60	12	15	1	15	45
	KIT.	75	1	75	56	15	1	15	60
	LAUND.	75	4	300	28	11	4	44	256
	LANAI 1	75	1	75	57	15	1	15	60
	LANAI 2	75	2	150	43	15	2	30	120

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PROJECT NAME:
BY:
SUBJECT:
Sht. Of 3-14

UNIT TYPE	LOCATION	EXIST. FIXT. (W)	QUAN.	ENERGY USED	AREA (SF)	NEW FIX. (W)	QUAN.	ENERGY USED (W)	ENERGY SAVED (W)
32-IV	L/R	75	1	75	92	15	1	15	60
	D/R	75	4	300	63	15	4	60	240
	B/R 1	75	3	225	60	15	3	45	180
	B/R 2	75	2	150	46	15	2	30	120
	B/R 3	75	2	150	42	15	2	30	120
	B/R 4	75	3	225	48	11	3	33	192
	MAID'S	75	2	150	28	11	2	22	128
	BATH 1	75	1	75	20	15	1	15	60
	BATH 2	75	1	75	12	15	1	15	60
	KIT.	75	1	75	56	15	1	15	60
	LAUND.	75	2	150	28	15	2	30	120
	LANAI 1	75	2	150	57	15	2	30	120
	LANAI 2	40	2	80	43	15	2	30	50

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DATE:

JOB No.:

PROJECT NAME:

BY:

SUBJECT:

UNIT TYPE	LOCATION	EXIST. FIXT. (W)	QUAN.	ENERGY USED	AREA (SF)	NEW FIX. (W)	QUAN.	ENERGY USED (W)	ENERGY SAVED (W)
57-I	L/R	75	5	375	62	11	5	55	320
	D/R	75	2	150	48	15	2	30	120
	B/R 1	75	2	150	52	15	2	30	120
	B/R 2	75	1	75	42	15	1	15	60
	KIT.	75	4	300	48	15	4	60	240
	LAUND.	60	2	120	24	15	2	30	120
	BATH	75	2	150	21	11	2	22	128

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DATE: JOB No.:
PROJECT NAME: BY:
SUBJECT: Sht. 3-16
Of

UNIT TYPE	LOCATION	EXIST. FIXT. (W)	QUAN.	ENERGY USED	AREA (SF)	NEW FIX.(W)	QUAN.	ENERGY USED (W)	ENERGY SAVED (W)
57-II	L/R	75	3	225	111	15	3	45	180
	B/R 1	75	1	75	46	15	1	15	60
	B/R 2	75	1	75	35	15	1	15	60
	B/R 3	75	1	75	35	15	1	15	60
	BATH	NO INCADESCENT FIXTURES							
	TOILET	" " "							
	KIT.	40	3	120	35	15	3	45	75
	LAUND.	75	1	75	12	15	1	15	60

NOTE: UNIT TYPES 57-IV, 57-VI, 57-VIII and 57-IX HAVE THE SAME INTERIOR FLOOR PLAN AS UNIT TYPE 57-II

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DATE:
JOB No.:
PROJECT NAME:
BY:
SUBJECT:
Sht. 3-17
Of

UNIT TYPE	LOCATION	EXIST. FIXT. (W)	QUAN.	ENERGY USED	AREA (SF)	NEW FIX (W)	QUAN.	ENERGY USED (W)	ENERGY SAVED (W)
57-III	L/R	75	3	225	111	15	3	45	180
	B/R 1	60	1	60	49	15	1	15	45
	B/R 2	75	1	75	42	15	1	15	60
	B/R 3	75	1	75	46	15	1	15	60
	BATH	No incadescent fixtures							
	TOILET	No incadescent fixtures							
	KIT.	No incadescent fixtures							
	LAUND.	75	1	75	9	15	1	15	60

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DATE: JOB No.:

PROJECT NAME: BY:

SUBJECT: Sht. 3-18 Of

UNIT TYPE	LOCATION	EXIST. FIXT. (W)	QUAN.	ENERGY USED	AREA (SF)	NEW FIX (W)	QUAN.	ENERGY USED (W)	ENERGY SAVED (W)
57-V	L/R	75	3	225	111	15	3	45	180
	B/R 1	75	1	75	53	15	1	15	60
	B/R 2	75	1	75	53	15	1	15	60
	BATH	No incadescent fixtures							
	KIT.	No incadescent fixtures							
	LAUND.	75	1	75	9	15	1	15	60

NOTE: UNIT TYPE 57-VII HAS THE SAME INTERIOR FLOOR PLAN AS UNIT TYPE 57-V.

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DATE: JOB No.:
PROJECT NAME: BY:
SUBJECT: Sht. 3-19 Of

UNIT TYPE	LOCATION	EXIST. FIXT. (W)	QUAN.	ENERGY USED	AREA (SF)	NEW FIX (W)	QUAN.	ENERGY USED (W)	ENERGY SAVED (W)
60-I	L/R	60	1	60	68	15	1	15	45
	B/R 1	No Incadescent fixtures							
	B/R 2	"	"		"				
	BATH	"	"		"				
	TOILET	"	"		"				
	KIT.	"	"		"				
60-II	L/R	60	1	60	69	15	1	15	45
	B/R 1	No Incadescent fixtures							
	B/R 2	"	"		"				
	B/R 3	"	"		"				
	B/R 4	"	"		"				
	BATH	"	"		"				
	TOILET	"	"		"				
	KIT.	"	"		"				
60-III	L/R	60	1	60	69	15	1	15	45
	B/R 1	No incadescent fixtures							
	B/R 2	"	"		"				
	B/R 3	"	"		"				
	BATH	"	"		"				
	TOILET	"	"		"				
	KIT.	"	"		"				

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DATE: JOB No.:
PROJECT NAME: BY:
SUBJECT: Sht. 3-20 Of

UNIT TYPE	LOCATION	EXIST. FIXT. (W)	QUAN.	ENERGY USED	AREA (SF)	NEW FIX (W)	QUAN.	ENERGY USED (W)	ENERGY SAVED (W)
71-I	L/R	75	1	75	275	15	1	15	60
	BATH 1	No incadescent fixtures							
	BATH 2	"	"		"				
	F/R	"	"		"				
	B/R 1	"	"		"				
	B/R 2	"	"		"				
	B/R 3	"	"		"				
	B/R 4	"	"		"				
	KIT.	"	"		"				
	LAUND.	"	"		"				

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DATE:
JOB No.:
PROJECT NAME:
BY:
SUBJECT:
Sht. 3-21
Of

3. Summary of Savings (per unit)

Unit Type	LOCATION	LIGHTING SAVINGS (W)	HRS PER DAY OPERATION	DAILY SAVINGS (KWH)
20-II	L/R	38	6	0.228
	D/R	340	4	1.360
	B/R 1	340	4	1.360
	B/R 2	85	4	0.340
	B/R 3	85	4	0.340
	B/R 4	85	4	0.340
	B/R 5	—	—	—
	B/R 6	—	—	—
	BATH 1	30	4	0.120
	BATH 2	185	4	0.740
	KIT.	45	4	0.180
	PANTRY	128	2	0.256
	LAUND.	135	2	0.270
	LANAI	60	6	0.360
	TOTAL			= 5.894 KWH/DAY

Assuming 60% of the lamps can be replaced Total = 0.60 (5.894 KWH/Day) = 3.536 $\frac{KWH}{Day}$

ANNUAL ENERGY SAVINGS (per unit)

= 3.536 KW/DAY × 365 Days/yr = 1,290 KWH/YR

ANNUAL COST SAVINGS

= 1,290 KWH/yr × ($0.068/KWH) = $87.72

Cost for Fluorescent Adaptors (see attached) : $ 835

Assuming only 60% the lamps can be replaced = 835 (.60) = 501

Payback = $\frac{\$\ 501}{\$\ 87.72\ /YR}$ = 5.7 YRS

SIR = 2.04 (see attached)

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DATE: JOB No.:
PROJECT NAME: BY:
SUBJECT:

Labor Rate: $21.81 + [illegible] LB = $38.16 SAY $38.20

PROJECT: Replace Incadescent Lights							ESTIMATOR		CHECKED BY	SHEET OF	SHEETS
TASK DESCRIPTION	QUANTITY		LABOR				EQUIPMENT		MATERIAL		TOTAL
Unit Type 20-II	NO. OF UNITS	UNIT MEAS	MH/UNIT	TOTAL HRS	UNIT PRICE	COST	UNIT PRICE	COST	UNIT PRICE	COST	
9W Fluores. Adaptor	0	EA			38.20	0			18		
11W " "	4	EA	0.15	0.6		22.92			20	80	102.92
15W " "	19	EA	0.15	2.85		108.87			22	418	526.87
								SUBTOTAL			629.79
								PROFIT	(10%)		62.98
								O/H	(15%)		103.92
								Tax	(4%)		31.87
								Bond	(1%)		8.29
								TOTAL			836.84
										SAY	$835

DA FORM 5418-R, Apr 85 CONTD

LIFE CYCLE COST ANALYSIS SUMMARY
ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP)

LOCATION: ____________ REGION NO. ____ PROJECT NUMBER ____________

PROJECT TITLE Replace Incadescent Lights FISCAL YEAR ________

DISCRETE PORTION NAME UNIT TYPE 20-IIC

ANALYSIS DATE ____________ ECONOMIC LIFE 25 YEARS PREPARED BY ____

1. INVESTMENT COSTS
   A. CONSTRUCTION COST $ 501
   B. SIOH (5.5%) $ 27.56
   C. DESIGN COST (10%) $ 50.10
   D. ENERGY CREDIT CALC (1A+1B+1C)X.9 $ 520.79
   E. SALVAGE VALUE OF EXISTING EQUIPMENT $ —
   F. TOTAL INVESTMENT (1D-1E) $ 520.79

2. ENERGY SAVINGS (+) / COST (-)
   ANALYSIS DATE ANNUAL SAVINGS, UNIT COST $ DISCOUNTED SAVINGS

FUEL	COST $/MBTU(1)	SAVINGS MBTU/YR(2)	ANNUAL $ SAVINGS(3)	DISCOUNT FACTOR(4)	DISCOUNTED SAVINGS(5)
A. ELEC	$ 19.93	4.403	$ 87.72	12.12	$ 1063
B. DIST	$		$		$
C. RESID	$		$		$
D. NG	$		$		$
E. COAL	$		$		$
F. TOTAL			$ 87.72		$ 1063

3. NON ENERGY SAVINGS (+) / COST (-)
   A. ANNUAL RECURRING (+/-) $ 0
      (1) DISCOUNT FACTOR (TABLE 1) ____
      (2) DISCOUNTED SAVING/COST (3A X 3A1) $ 0

   B. NON RECURRING SAVINGS (+) / COST (-)

ITEM	SAVINGS $ (+) COST $ (-)(1)	YEAR OF OCCURRENCE(2)	DISCOUNT FACTOR (3)	DISCOUNTED SAVINGS (+) COST(-)(4)
a.	$			$
b.	$			$
c.	$			$
d. TOTAL	$			$

   C. TOTAL NON ENERGY DISCOUNTED SAVINGS (+) / COST (-) (3A2+3Bd4) $ 0

   D. PROJECT NON ENERGY QUALIFICATION TEST
   (1) 25% MAX NON ENERGY CALC (2F5 X .33) $ 350.84
      a. IF 3D1 IS = OR 3C GO TO ITEM 4
      b. IF 3D1 IS 3C CALC SIR = (2F5+3D1) : 1F = ____
      c. IF 3D1b IS = 1 GO TO ITEM 4
      d. IF 3D1b IS 1 PROJECT DOES NOT QUALIFY

4. FIRST YEAR DOLLAR SAVINGS 2F3+3A+(3B1d : YEARS ECONOMIC LIFE) $ 87.72

5. TOTAL NET DISCOUNTED SAVINGS (2F5+3C) $ 1063

6. SIR (IF 1 PROJECT DOES NOT QUALIFY) (SIR)=(5 : 1F)= 2.04

UNIT TYPE	LOCATION	LIGHTING SAVINGS(W)	HRS PER DAY OPERATION	DAILY SAVINGS (KWH)
20-III	L/R	60	6	0.360
	D/R	240	4	0.960
	B/R 1	120	4	0.480
	B/R 2	120	4	0.480
	B/R 3	120	4	0.480
	B/R 4	132	4	0.528
	B/R 5	132	4	0.528
	BATH	204	4	0.816
	TOILET	51	1	0.051
	KIT.	60	4	0.240
	LAUND.	60	2	0.120
	PANTRY	60	2	0.120
	LANAI	60	6	0.360

TOTAL = 5.523 KWH/DAY

Assuming only 70% of the lamps can be replaced Total = 0.70(5.523) = 3.866 KWH/DAY

ANNUAL ENERGY SAVINGS (per unit)

= 3.866 KWH/DAY × 365 Days/YR = 1,411 KWH/YR

ANNUAL COST SAVINGS

= 1,411 KWH/YR × ($0.068/KWH) = $95.95

Cost for Fluorescent Adaptors (see attached): $805

Assuming only 70% of the lamps can be replaced Total = 0.70(805) = $563.50

$$\text{Payback} = \frac{\$\ 563.5}{\$\ 95.95/\text{yr}} = 5.9 \text{ yrs}$$

SIR = 1.99 (see attached)

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DATE: JOB No.:
PROJECT NAME: BY:
SUBJECT:

ABOR RATE : $21.81 + 75% LB = 38. SAY $38.20

PROJECT Replace Incadescent Lights | ESTIMATOR | CHECKED BY | SHEET OF | TS

TASK DESCRIPTION	QUANTITY		LABOR				EQUIPMENT		MATERIAL		TOTAL
Unit Type 20-III	NO. OF UNITS	UNIT MEAS	MH/UNIT	TOTAL HRS	UNIT PRICE	COST	UNIT PRICE	COST	UNIT PRICE	COST	
9w Fluores. Adaptor	8	EA	0.15	1.20	38.20	45.84			18	144	189.84
11W Fluores. Adaptor	0	EA	0.15	0		0			20	0	0
15W Fluores. Adaptor	15	EA	0.15	2.25	↓	85.95			22	336	415.95
								Subtotal			605.79
								Profit	(10%)		60.58
								O/H	(15%)		99.96
								Tax	(4%)		30.65
								Bond	(1%)		7.97
								Total			804.95
NOTE :										SAY $	805
a) Mat'l cost quote w/											
Pelsa Lighting (524-3744)											
(Bobby Solomon)											

DA FORM 5418-R, Apr 85 CONTD

LIFE CYCLE COST ANALYSIS SUMMARY
ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP)

LOCATION: ______ REGION NO. ____ PROJECT NUMBER ______

PROJECT TITLE Replace Incadescent Lights FISCAL YEAR ______

DISCRETE PORTION NAME UNIT TYPE 20-IIIC

ANALYSIS DATE ______ ECONOMIC LIFE 25 YEARS PREPARED BY ____

1. INVESTMENT COSTS
   - A. CONSTRUCTION COST $ 563.50
   - B. SIOH (5.5%) $ 30.99
   - C. DESIGN COST (10%) $ 56.35
   - D. ENERGY CREDIT CALC (1A+1B+1C)X.9 $ 585.76
   - E. SALVAGE VALUE OF EXISTING EQUIPMENT $ —
   - F. TOTAL INVESTMENT (1D-1E) $ 585.76

2. ENERGY SAVINGS (+) / COST (-)
   ANALYSIS DATE ANNUAL SAVINGS, UNIT COST $ DISCOUNTED SAVINGS

FUEL	COST $/MBTU(1)	SAVINGS MBTU/YR(2)	ANNUAL $ SAVINGS(3)	DISCOUNT FACTOR(4)	DISCOUNTED SAVINGS(5)
A. ELEC	$ 19.93	4.82/unit	$ 95.95	12.12	$ 1163
B. DIST	$		$		$
C. RESID	$		$		$
D. NG	$		$		$
E. COAL	$		$		$
F. TOTAL			$ 95.95		$ 1163

3. NON ENERGY SAVINGS (+) / COST (-)
   - A. ANNUAL RECURRING (+/-) $ 0
     - (1) DISCOUNT FACTOR (TABLE 1) ____
     - (2) DISCOUNTED SAVING/COST (3A X 3A1) $ 0
   - B. NON RECURRING SAVINGS (+) / COST (-)

ITEM	SAVINGS $ (+) COST $ (-)(1)	YEAR OF OCCURRENCE(2)	DISCOUNT FACTOR (3)	DISCOUNTED SAVINGS (+) COST(-)(4)
a.	$			$
b.	$			$
c.	$			$
d. TOTAL	$			$

   - C. TOTAL NON ENERGY DISCOUNTED SAVINGS (+) / COST (-) (3A2+3Bd4) $ 0
   - D. PROJECT NON ENERGY QUALIFICATION TEST
     - (1) 25% MAX NON ENERGY CALC (2F5 X .33) $ 383.79
       - a. IF 3D1 IS = OR 3C GO TO ITEM 4
       - b. IF 3D1 IS 3C CALC SIR = (2F5+3D1) : 1F = ____
       - c. IF 3D1b IS = 1 GO TO ITEM 4
       - d. IF 3D1b IS 1 PROJECT DOES NOT QUALIFY

4. FIRST YEAR DOLLAR SAVINGS 2F3+3A+(3B1d : YEARS ECONOMIC LIFE) $ 95.95

5. TOTAL NET DISCOUNTED SAVINGS (2F5+3C) $ 1163

6. SIR (IF 1 PROJECT DOES NOT QUALIFY) (SIR)=(5 : 1F)= 1.99

UNIT TYPE	LOCATION	LIGHTING SAVINGS (W)	HRS PER DAY OPERATION	DAILY SAVINGS (KWH)
20-IV	L/R	180	6	1.080
	D/R	120	4	0.480
	B/R 1	120	4	0.480
	B/R 2	120	4	0.480
	B/R 3	120	4	0.480
	B/R 4	128	4	0.512
	BATH 1	60	4	0.240
	BATH 2	102	4	0.408
	KIT.	180	4	0.720
	LAUND.	85	2	0.085
	LANAI	320	6	1.920
TOTAL			=	6.885 KWH/DAY

Assuming 70% of the lamps can be replaced Total = 6.885 x .70 = 4.820 kWH/day

ANNUAL ENERGY SAVINGS:

= 4.820 kWH/DAY x 365 DAY/YR = 1,759 KWH/YR

ANNUAL COST SAVINGS

= 1,759 KWH/YR x ($0.068/KWH) = $119.61

Cost for fluorescent Adaptors (see attached): $890

Assuming 70% of the lamps can be replaced Total = 890 (.70) = 623

$$\text{Payback} = \frac{\$\ 623}{\$\ 119.61\ /\text{yR}} = 5.2\ \text{yrs}$$

SIR = 2.24 (see attached)

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DATE: | JOB No.:
PROJECT NAME: | BY:
SUBJECT: | Sht. 3-28 Of

ABOR RATE : $21.81 + 75% LB = 38. SAY $38.20

PROJECT Replace Incadescent Lights							ESTIMATOR	CHECKED BY	SHEET	OF	S
	QUANTITY		LABOR				EQUIPMENT		MATERIAL		
TASK DESCRIPTION	NO. OF UNITS	UNIT MEAS	MH/UNIT	TOTAL HRS	UNIT PRICE	COST	UNIT PRICE	COST	UNIT PRICE	COST	TOTAL
Unit Type 20-IV											
9W Fluores. Adaptor	2	EA	0.15	0.30	38.20	11.46			18	36	47.46
11W Fluores. Adaptor	7	EA	0.15	1.05		40.11			20	140	180.11
15W Fluores. Adaptor	16	EA	0.15	2.40		91.68			22	352	443.68
								Subtotal			671.25
								Profit	(10%)		67.13
								O/H	(15%)		110.76
								Tax	(4%)		33.97
								Bond	(1%)		8.83
								Total			891.93
NOTE :										SAY	$890
a) Mat'l cost quote w/											
Pelsa Lighting (524-3744)											
(Bobby Solomon)											

DA FORM 5418-R, Apr 85 CONTD

LIFE CYCLE COST ANALYSIS SUMMARY
ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP)

LOCATION: ____________ REGION NO. ____ PROJECT NUMBER ____________

PROJECT TITLE Replace Incadescent Lights FISCAL YEAR ________

DISCRETE PORTION NAME UNIT TYPE 20-IV

ANALYSIS DATE ____________ ECONOMIC LIFE 25 YEARS PREPARED BY ____

1. INVESTMENT COSTS
   - A. CONSTRUCTION COST $ 623
   - B. SIOH (5.5%) $ 34.27
   - C. DESIGN COST (10%) $ 62.30
   - D. ENERGY CREDIT CALC (1A+1B+1C)X.9 $ 647.61
   - E. SALVAGE VALUE OF EXISTING EQUIPMENT $ ______
   - F. TOTAL INVESTMENT (1D-1E) $ 647.61

2. ENERGY SAVINGS (+) / COST (-)
   ANALYSIS DATE ANNUAL SAVINGS, UNIT COST $ DISCOUNTED SAVINGS

FUEL	COST $/MBTU(1)	SAVINGS MBTU/YR(2)	ANNUAL $ SAVINGS(3)	DISCOUNT FACTOR(4)	DISCOUNTED SAVINGS(5)
A. ELEC	$ 19.92	6.00/unit	$ 119.61	12.12	$ 1,450
B. DIST	$		$		$
C. RESID	$		$		$
D. NG	$		$		$
E. COAL	$		$		$
F. TOTAL			$		$ 1,450

3. NON ENERGY SAVINGS (+) / COST (-)
   - A. ANNUAL RECURRING (+/-) $ 0
     - (1) DISCOUNT FACTOR (TABLE 1) ______
     - (2) DISCOUNTED SAVING/COST (3A X 3A1) $ 0
   - B. NON RECURRING SAVINGS (+) / COST (-)

ITEM	SAVINGS $ (+) COST $ (-)(1)	YEAR OF OCCURRENCE(2)	DISCOUNT FACTOR (3)	DISCOUNTED SAVINGS (+) COST(-)(4)
a.	$			$
b.	$			$
c.	$			$
d. TOTAL	$			$

   - C. TOTAL NON ENERGY DISCOUNTED SAVINGS (+) / COST (-) (3A2+3Bd4) $ 0
   - D. PROJECT NON ENERGY QUALIFICATION TEST
     - (1) 25% MAX NON ENERGY CALC (2F5 X .33) $ 478.50
       - a. IF 3D1 IS = OR 3C GO TO ITEM 4
       - b. IF 3D1 IS 3C CALC SIR = (2F5+3D1) : 1F = ______
       - c. IF 3D1b IS = 1 GO TO ITEM 4
       - d. IF 3D1b IS 1 PROJECT DOES NOT QUALIFY

4. FIRST YEAR DOLLAR SAVINGS 2F3+3A+(3B1d : YEARS ECONOMIC LIFE) $ 119.61

5. TOTAL NET DISCOUNTED SAVINGS (2F5+3C) $ 1450

6. SIR (IF 1 PROJECT DOES NOT QUALIFY) (SIR)=(5 : 1F)= 2.24

UNIT TYPE	LOCATION	LIGHTING SAVINGS(W)	HRS PER DAY OPERATION	DAILY SAVINGS (KWH)
20-V	L/R	180	6	1.080
	D/R	120	4	0.480
	B/R 1	120	4	0.480
	B/R 2	128	4	0.512
	BATH	145	4	0.580
	TOILET	132	1	0.132
	KIT.	120	4	0.480
	LAUND.	45	2	0.090
	LANAI	256	6	1.080
TOTAL			=	4.914 KWH/Day

Assuming only 70% of the lamps can be replaced Total = .70(4.914) = 3.440 KWH/Day

ANNUAL ENERGY SAVINGS

= 3.440 KWH/Day × 365 DAY/YR = 1,256 KWH/YR

ANNUAL COST SAVINGS

= 1256 KWH/YR × (\$0.068 / KWH) = \$85.08

Cost for fluorescent adaptor (see attached): \$680.00

Assuming only 70% of the lamps can be replaced Total Cost = .70(680) = \$476

Payback = $\frac{\$476}{\$85.08/\text{yr}}$ = 5.6 yrs

SIR = 2.08 (see attached)

CEDRIC D. O. CHONG & ASSOCIATES, INC.
CONSULTING MECHANICAL & ELECTRICAL ENGINEERS
2130-E North King Street Honolulu, Hawaii 96819
Telephone (808) 847-6557 Telefax: (808) 847-6550

DATE: JOB No.:

PROJECT NAME: BY:

SUBJECT:

[illegible]ABOR RATE : $21.81 + 75% LB = 38.[illegible] SAY $38.20

PROJECT: Replace Incadescent Lights | ESTIMATOR | CHECKED BY | SHEET OF [illegible]S

TASK DESCRIPTION	QUANTITY: NO. OF UNITS	QUANTITY: UNIT MEAS	LABOR: MH/UNIT	LABOR: TOTAL HRS	LABOR: UNIT PRICE	LABOR: COST	EQUIPMENT: UNIT PRICE	EQUIPMENT: COST	MATERIAL: UNIT PRICE	MATERIAL: COST	TOTAL
Unit type 20-V											
9w Fluores. Adaptor	2	EA	0.15	0.30	38.20	11.64			18	36	47.64
11W Fluores. Adaptor	6	EA	0.15	0.9		34.38			20	120	154.38
15W Fluores. Adaptor	12	EA	0.15	1.8		68.76			22	240	308.76
								Subtotal			510.78
								Profit	(10%)		51.08
								O/H	(15%)		84.28
								Tax	(4%)		25.85
								Bond	(1%)		6.72
								Total			678.70
NOTE:										SAY $	680
a) Mat'l cost quote w/											
Pelsa Lighting (524-3744)											
(Bobby Solomon)											

DA FORM 5418-R, Apr 85 CONTD

LIFE CYCLE COST ANALYSIS SUMMARY
ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP)

LOCATION: ________ REGION NO. ____ PROJECT NUMBER ________

PROJECT TITLE Replace Incadescent Lights FISCAL YEAR ________

DISCRETE PORTION NAME UNIT TYPE 20-VI

ANALYSIS DATE ________ ECONOMIC LIFE 25 YEARS PREPARED BY ____

1. INVESTMENT COSTS
   - A. CONSTRUCTION COST $ 476
   - B. SIOH (5.5%) $ 26.18
   - C. DESIGN COST (10%) $ 47.60
   - D. ENERGY CREDIT CALC (1A+1B+1C)X.9 $ 494.80
   - E. SALVAGE VALUE OF EXISTING EQUIPMENT $ —
   - F. TOTAL INVESTMENT (1D-1E) $ 494.80

2. ENERGY SAVINGS (+) / COST (-)
   ANALYSIS DATE ANNUAL SAVINGS, UNIT COST $ DISCOUNTED SAVINGS

FUEL	COST $/MBTU(1)	SAVINGS MBTU/YR(2)	ANNUAL $ SAVINGS(3)	DISCOUNT FACTOR(4)	DISCOUNTED SAVINGS(5)
A. ELEC	$19.93	4.2867/unit	$ 85.08	12.12	$ 1031
B. DIST	$		$		$
C. RESID	$		$		$
D. NG	$		$		$
E. COAL	$		$		$
F. TOTAL			$ 85.08		$ 1031

3. NON ENERGY SAVINGS (+) / COST (-)
   - A. ANNUAL RECURRING (+/-) $ 0
     - (1) DISCOUNT FACTOR (TABLE 1) ____
     - (2) DISCOUNTED SAVING/COST (3A X 3A1) $ 0

   B. NON RECURRING SAVINGS (+) / COST (-)

ITEM	SAVINGS $ (+) COST $ (-)(1)	YEAR OF OCCURRENCE(2)	DISCOUNT FACTOR (3)	DISCOUNTED SAVINGS (+) COST(-)(4)
a.	$			$
b.	$			$
c.	$			$
d. TOTAL	$			$

   C. TOTAL NON ENERGY DISCOUNTED SAVINGS (+) / COST (-) (3A2+3Bd4) $ 0

   D. PROJECT NON ENERGY QUALIFICATION TEST
   (1) 25% MAX NON ENERGY CALC (2F5 X .33) $ 340.23
   - a. IF 3D1 IS = OR 3C GO TO ITEM 4
   - b. IF 3D1 IS 3C CALC SIR = (2F5+3D1) : 1F = ____
   - c. IF 3D1b IS = 1 GO TO ITEM 4
   - d. IF 3D1b IS 1 PROJECT DOES NOT QUALIFY

4. FIRST YEAR DOLLAR SAVINGS 2F3+3A+(3B1d : YEARS ECONOMIC LIFE) $ 85.08

5. TOTAL NET DISCOUNTED SAVINGS (2F5+3C) $ 1031

6. SIR (IF 1 PROJECT DOES NOT QUALIFY) (SIR)=(5 : 1F)= 2.08

UNIT TYPE	LOCATION	LIGHTING SAVINGS(W)	HRS PER DAY OPERATION	DAILY SAVINGS (KWH)
32-I & 32-II	4R	45	6	0.270

Assuming only 70% of the lamps can be replaced Total = 0.270(.70) = 0.189 $\frac{KWH}{YR}$

ANNUAL ENERGY SAVINGS

= 0.189 KWH/DAY × 365 DAY/YR = 68.99 KWH/YR

ANNUAL COST SAVINGS

= 68.99 KWH/YR × ($0.068 /KWH) = $4.69

Cost for Fluorescent Adaptor = $ 37.00
(see attached)

Assuming only 70% of the lamps can be replaced Total = 37.00 × .70 = 25.90

Payback = $\frac{\$\ 25.90}{\$\ 4.69\ /YR}$ = 5.5 YRS

SIR = 2.11 (see attached)

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DATE: JOB No.:

PROJECT NAME: BY:

SUBJECT:

ABOR RATE : $21.81 + 75% LB = 38.[illegible] SAY $38.20

PROJECT Replace Incadescent Lights							ESTIMATOR		CHECKED BY		SHEET OF
TASK DESCRIPTION	QUANTITY		LABOR				EQUIPMENT		MATERIAL		TOTAL
	NO. OF UNITS	UNIT MEAS	MH/UNIT	TOTAL HRS	UNIT PRICE	COST	UNIT PRICE	COST	UNIT PRICE	COST	
Unit Type 32-I & II											
9w Fluores. Adaptor	0	EA	0.15		38.20	0			18		
11W Fluores. Adaptor	0	EA	0.15			0			20		
15W Fluores. Adaptor	1	EA	0.15	0.15		5.73			22	22	27.73
								Subtotal			27.73
								Profit	(10%)		2.77
								O/H	(15%)		4.58
								Tax	(4%)		1.40
								Bond	(1%)		0.36
								Total			36.85
NOTE :										SAY $	37.00
a) Mat'l cost quote w/											
Pelsa Lighting (524-3744)											
(Bobby Solomon)											

DA FORM 5418-R, Apr 85 CONTD

LIFE CYCLE COST ANALYSIS SUMMARY
ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP)

LOCATION: ____________ REGION NO. ____ PROJECT NUMBER ____________

PROJECT TITLE Replace Incadescent Lights FISCAL YEAR ________

DISCRETE PORTION NAME UNIT TYPE 32-I & 32-II

ANALYSIS DATE ____________ ECONOMIC LIFE 25 YEARS PREPARED BY ____

1. INVESTMENT COSTS
   - A. CONSTRUCTION COST $ 25.90
   - B. SIOH (5.5%) $ 1.42
   - C. DESIGN COST (10%) $ 2.59
   - D. ENERGY CREDIT CALC (1A+1B+1C)X.9 $ 26.92
   - E. SALVAGE VALUE OF EXISTING EQUIPMENT $ ____
   - F. TOTAL INVESTMENT (1D-1E) $ 26.92

2. ENERGY SAVINGS (+) / COST (-)
   ANALYSIS DATE ANNUAL SAVINGS, UNIT COST $ DISCOUNTED SAVINGS

FUEL	COST $/MBTU(1)	SAVINGS MBTU/YR(2)	ANNUAL $ SAVINGS(3)	DISCOUNT FACTOR(4)	DISCOUNTED SAVINGS(5)
A. ELEC	$ 19.94	0.235/unit	$ 4.69	12.12	$ 56.84
B. DIST	$		$		$
C. RESID	$		$		$
D. NG	$		$		$
E. COAL	$		$		$
F. TOTAL			$ 4.69		$ 56.84

3. NON ENERGY SAVINGS (+) / COST (-)
   - A. ANNUAL RECURRING (+/-) $ 0
     - (1) DISCOUNT FACTOR (TABLE 1) ____
     - (2) DISCOUNTED SAVING/COST (3A X 3A1) $ 0
   - B. NON RECURRING SAVINGS (+) / COST (-)

ITEM	SAVINGS $ (+) COST $ (-)(1)	YEAR OF OCCURRENCE(2)	DISCOUNT FACTOR (3)	DISCOUNTED SAVINGS (+) COST(-)(4)
a. ____	$			$
b. ____	$			$
c. ____	$			$
d. TOTAL	$			$

   - C. TOTAL NON ENERGY DISCOUNTED SAVINGS (+) / COST (-) (3A2+3Bd4) $ 0
   - D. PROJECT NON ENERGY QUALIFICATION TEST
     - (1) 25% MAX NON ENERGY CALC (2F5 X .33) $ 18.76
       - a. IF 3D1 IS = OR 3C GO TO ITEM 4
       - b. IF 3D1 IS 3C CALC SIR = (2F5+3D1) : 1F = ____
       - c. IF 3D1b IS = 1 GO TO ITEM 4
       - d. IF 3D1b IS 1 PROJECT DOES NOT QUALIFY

4. FIRST YEAR DOLLAR SAVINGS 2F3+3A+(3B1d : YEARS ECONOMIC LIFE) $ 4.69

5. TOTAL NET DISCOUNTED SAVINGS (2F5+3C) $ 56.84

6. SIR (IF 1 PROJECT DOES NOT QUALIFY) (SIR)=(5 : 1F)= 2.11

UNIT TYPE	LOCATION	LIGHTING SAVINGS (W)	HRS PER DAY OPERATION	DAILY SAVINGS (KWH)
32-III	L/R	180	6	1.080
	D/R	320	4	1.280
	B/R 1	180	4	0.720
	B/R 2	120	4	0.480
	B/R 3	180	4	0.720
	MAID'S	128	4	0.512
	BATH 1	45	4	0.180
	BATH 2	45	4	0.180
	KIT.	60	4	0.240
	LAUND.	256	2	0.512
	LANAI 1	60	6	0.360
	LANAI 2	120	2	0.240
TOTAL			=	6.504 KWH/Day

Assuming only 70% of the lamps can be replaced Total = .70 (6.504) = 4.553

ANNUAL ENERGY SAVINGS

= 4.553 KWH/Day × 365 Days/YR = 1662 KWH/YR

ANNUAL Cost Savings

= 1,662 KWH/YR × ($ 0.068 /YR) = $113

Cost for Fluorescent Adaptors = $ 1000
(see attached)

Assuming only 70% of the lamps can be replaced Total = (1000 × .70) = $700

Payback = $ 700 / $ 113 /YR = 6.2 yrs.

SIR = 1.88 (see attached)

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DATE: | JOB No.:
PROJECT NAME: | BY:
SUBJECT: | Sht. 3-37 Of

ABOR RATE : $21.81 + 75% LB = 38. SAY $38.20

PROJECT Replace Incadescent Lights	QUANTITY		LABOR				EQUIPMENT		MATERIAL		TOTAL
TASK DESCRIPTION Unit Type 32 - III	NO. OF UNITS	UNIT MEAS	MH/UNIT	TOTAL HRS	UNIT PRICE	COST	UNIT PRICE	COST	UNIT PRICE	COST	
9w Fluores. Adaptor	0	EA	0.15		38.20	0			18		
11W Fluores. Adaptor	11	EA	0.15	1.65		63.03			20	220	283.03
15W Fluores. Adaptor	17	EA	0.15	2.55		97.41			22	374	471.41
								Subtotal			754.44
								Profit	(10%)		75.44
								O/H	(15%)		124.48
								Tax	(4%)		38.17
								Bond	(1%)		9.93
								Total			1002.47
NOTE:										SAY $	1000
a) Mat'l cost quote w/											
Pelsa Lighting (524-3144)											
(Bobby Solomon)											

LIFE CYCLE COST ANALYSIS SUMMARY
ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP)

LOCATION: ______ REGION NO. ____ PROJECT NUMBER ______

PROJECT TITLE Replace Incadescent Lights FISCAL YEAR ______

DISCRETE PORTION NAME UNIT TYPE 32-III

ANALYSIS DATE ______ ECONOMIC LIFE 25 YEARS PREPARED BY ____

1. INVESTMENT COSTS
   A. CONSTRUCTION COST $ 700
   B. SIOH (5.5%) $ 38.50
   C. DESIGN COST (10%) $ 70.00
   D. ENERGY CREDIT CALC (1A+1B+1C)X.9 $ 727.65
   E. SALVAGE VALUE OF EXISTING EQUIPMENT $ ______
   F. TOTAL INVESTMENT (1D-1E) $ 727.65

2. ENERGY SAVINGS (+) / COST (-)
   ANALYSIS DATE ANNUAL SAVINGS, UNIT COST $ DISCOUNTED SAVINGS

FUEL	COST $/MBTU(1)	SAVINGS MBTU/YR(2)	ANNUAL $ SAVINGS(3)	DISCOUNT FACTOR(4)	DISCOUNTED SAVINGS(5)
A. ELEC	$19.92	5.672/unit	$ 113	12.12	$ 1370
B. DIST	$		$		$
C. RESID	$		$		$
D. NG	$		$		$
E. COAL	$		$		$
F. TOTAL			$ 113		$ 1370

3. NON ENERGY SAVINGS (+) / COST (-)
   A. ANNUAL RECURRING (+/-) $ 0
      (1) DISCOUNT FACTOR (TABLE 1) ______
      (2) DISCOUNTED SAVING/COST (3A X 3A1) $ 0

   B. NON RECURRING SAVINGS (+) / COST (-)

ITEM	SAVINGS $ (+) COST $ (-)(1)	YEAR OF OCCURRENCE(2)	DISCOUNT FACTOR (3)	DISCOUNTED SAVINGS (+) COST(-)(4)
a.	$			$
b.	$			$
c.	$			$
d. TOTAL	$			$

   C. TOTAL NON ENERGY DISCOUNTED SAVINGS (+) / COST (-) (3A2+3Bd4) $ 0

   D. PROJECT NON ENERGY QUALIFICATION TEST
   (1) 25% MAX NON ENERGY CALC (2F5 X .33) $ 452.10
      a. IF 3D1 IS = OR 3C GO TO ITEM 4
      b. IF 3D1 IS 3C CALC SIR = (2F5+3D1) : 1F = ______
      c. IF 3D1b IS = 1 GO TO ITEM 4
      d. IF 3D1b IS 1 PROJECT DOES NOT QUALIFY

4. FIRST YEAR DOLLAR SAVINGS 2F3+3A+(3B1d : YEARS ECONOMIC LIFE) $ 113

5. TOTAL NET DISCOUNTED SAVINGS (2F5+3C) $ 1370

6. SIR (IF 1 PROJECT DOES NOT QUALIFY) (SIR)=(5 : 1F)= 1.88

UNIT TYPE	LOCATION	LIGHTING SAVINGS(W)	HRS PER DAY OPERATION	DAILY SAVINGS (KWH)
32-IV	L/R	60	6	0.360
	D/R	240	4	0.960
	B/R1	180	4	0.720
	B/R2	120	4	0.480
	B/R3	120	4	0.480
	B/R4	192	4	0.768
	MAID'S	128	4	0.512
	BATH 1	60	4	0.240
	BATH 2	60	4	0.240
	KIT.	120	4	0.480
	LAUND.	120	2	0.240
	LANAI	50	6	0.300
TOTAL				= 5.780 KWH/Day

Assuming only 70% of the lamps can be replaced Total = 5.780 (.70) = 4.046

ANNUAL ENERGY SAVINGS

= 4.046 KWH/Day x 365 = 1477 KWH/yr

ANNUAL COST SAVINGS

= 1477 KWH/yr x ($0.068 /KWH) = $ 100.44

Cost for Fluorescent Adaptor = $ 945.00
(see attached)

Assuming only 70% of the lamps can be replaced Total = .70(945) = 661.50

$$\text{Payback} = \frac{\$\ 661.50}{\$\ 100.44\ /yr} = 6.6 \text{ yrs}$$

SIR = 1.77 (see attached)

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DATE:	JOB No.:
PROJECT NAME:	BY:
SUBJECT:	Sht. 3-40 Of

ABOR RATE : $21.81 + 75% LB = 38 SAY $38.20

PROJEC Replace Incadescent Lights | ESTIMATOR | CHECKED BY | SHEET OF TS

TASK DESCRIPTION	QUANTITY		LABOR				EQUIPMENT		MATERIAL		TOTAL
Unit Type 32-IV	NO. OF UNITS	UNIT MEAS	MH/UNIT	TOTAL HRS	UNIT PRICE	COST	UNIT PRICE	COST	UNIT PRICE	COST	
9w Fluores. Adaptor	0	EA	0.15		38.20	0			18		
11W Fluores. Adaptor	5	EA	0.15	0.75		28.65			20	100	128.65
15W Fluores. Adaptor	21	EA	0.15	3.15		120.33			22	462	582.33
								Subtotal			710.98
								Profit	(10%)		71.10
								O/H	(15%)		117.31
								Tax	(4%)		35.98
								Bond	(1%)		9.35
								Total			944.72
NOTE :										SAY $	945.00
a) Mat'l cost quote w/											
Pelsa Lighting (524-3144)											
(Bobby Solomon)											

DA FORM 5418-R, Apr 85 CONTD

LIFE CYCLE COST ANALYSIS SUMMARY
ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP)

LOCATION: ______ REGION NO. ____ PROJECT NUMBER ______

PROJECT TITLE Replace Incadescent Lights FISCAL YEAR ______

DISCRETE PORTION NAME UNIT TYPE 32-IV

ANALYSIS DATE ______ ECONOMIC LIFE 25 YEARS PREPARED BY ______

1. INVESTMENT COSTS
   A. CONSTRUCTION COST $ 661.50
   B. SIOH (5.5%) $ 36.38
   C. DESIGN COST (10%) $ 66.15
   D. ENERGY CREDIT CALC (1A+1B+1C)X.9 $ 687.63
   E. SALVAGE VALUE OF EXISTING EQUIPMENT $ —
   F. TOTAL INVESTMENT (1D-1E) $ 687.63

2. ENERGY SAVINGS (+) / COST (-)
   ANALYSIS DATE ANNUAL SAVINGS, UNIT COST $ DISCOUNTED SAVINGS

FUEL	COST $/MBTU(1)	SAVINGS MBTU/YR(2)	ANNUAL $ SAVINGS(3)	DISCOUNT FACTOR(4)	DISCOUNTED SAVINGS(5)
A. ELEC	$ 19.93	5.041/unit	$ 100.44	12.12	$ 1217
B. DIST	$		$		$
C. RESID	$		$		$
D. NG	$		$		$
E. COAL	$		$		$
F. TOTAL			$ 100.44		$ 1217

3. NON ENERGY SAVINGS (+) / COST (-)
   A. ANNUAL RECURRING (+/-) $ 0
      (1) DISCOUNT FACTOR (TABLE 1) ______
      (2) DISCOUNTED SAVING/COST (3A X 3A1) $ 0

   B. NON RECURRING SAVINGS (+) / COST (-)

ITEM	SAVINGS $ (+) COST $ (-)(1)	YEAR OF OCCURRENCE(2)	DISCOUNT FACTOR (3)	DISCOUNTED SAVINGS (+) COST(-)(4)
a.	$			$
b.	$			$
c.	$			$
d. TOTAL	$			$

   C. TOTAL NON ENERGY DISCOUNTED SAVINGS (+) / COST (-) (3A2+3Bd4) $ 0

   D. PROJECT NON ENERGY QUALIFICATION TEST
   (1) 25% MAX NON ENERGY CALC (2F5 X .33) $ 401.61
      a. IF 3D1 IS = OR 3C GO TO ITEM 4
      b. IF 3D1 IS 3C CALC SIR = (2F5+3D1) : 1F = ______
      c. IF 3D1b IS = 1 GO TO ITEM 4
      d. IF 3D1b IS 1 PROJECT DOES NOT QUALIFY

4. FIRST YEAR DOLLAR SAVINGS 2F3+3A+(3B1d : YEARS ECONOMIC LIFE) $ 100.44

5. TOTAL NET DISCOUNTED SAVINGS (2F5+3C) $ 1217

6. SIR (IF 1 PROJECT DOES NOT QUALIFY) (SIR)=(5 : 1F)= 1.77

UNIT TYPE	LOCATION	LIGHTING SAVINGS(W)	HRS PER DAY OPERATION	DAILY SAVINGS (KWH)
57-I	L/R	320	6	1.920
	D/R	120	4	0.480
	B/R 1	120	4	0.480
	B/R 2	60	4	0.240
	KIT.	240	4	0.960
	Laund.	120	2	0.240
	Bath	128	4	0.512

TOTAL = 4.832 KWH/Day

Assuming that only 70% of the lamps can be replaced Total = 4.832 (.70)

ANNUAL ENERGY SAVINGS = 3.382

= 3.382 KWH/Day × (365 Days/yR) = 1234 KWH/yR

ANNUAL COST SAVINGS

= 1234 KWH/yR × ($0.068 /KWH) = $83.91

Cost for fluorescent adaptr = $ 645.00
(see attached)

Assuming that only 70% of the lamps can be replaced, Total = .70(645) = 451.50

$$\text{Payback} = \frac{\$\ 451.50}{\$\ 83.91\ /\text{yr}} = 5.4\ \text{yrs}$$

SIR = 2.17 (see attached)

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DATE:	JOB No.:
PROJECT NAME:	BY:
SUBJECT:	Sht. 3-43 Of

ABOR RATE : \$21.81 + 75% LB = 38. SAY \$38.20

PROJECT eplace Incadescent Lights	QUANTITY		LABOR				EQUIPMENT		MATERIAL		TOTAL
TASK DESCRIPTION Unit type 57-I	NO. OF UNITS	UNIT MEAS	MH/UNIT	TOTAL HRS	UNIT PRICE	COST	UNIT PRICE	COST	UNIT PRICE	COST	
9w Fluores. Adaptor	0	EA	0.15	0	38.20	0			18		
11W Fluores. Adaptor	7	EA	0.15	1.05		40.11			20	140	180.11
15W Fluores. Adaptor	11	EA	0.15	1.65		63.03			22	242	305.03
								Subtotal			485.14
								Profit	(10%)		48.51
								O/H	(15%)		80.05
								Tax	(4%)		24.55
								Bond	(1%)		6.38
								Total			644.63
NOTE :										SAY \$	645
a) Mat'l cost quote w/											
Pelsa Lighting (524-3744)											
(Bobby Solomon)											

DA FORM 5418-R, Apr 85 CONTD

LIFE CYCLE COST ANALYSIS SUMMARY
ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP)

LOCATION: ______ REGION NO. ___ PROJECT NUMBER ______

PROJECT TITLE Replace Incadescent Lights FISCAL YEAR ______

DISCRETE PORTION NAME UNIT TYPE 57-I 0

ANALYSIS DATE ______ ECONOMIC LIFE 25 YEARS PREPARED BY ____

1. INVESTMENT COSTS
   A. CONSTRUCTION COST $ 451.50
   B. SIOH (5.5%) $ 24.83
   C. DESIGN COST (10%) $ 45.15
   D. ENERGY CREDIT CALC (1A+1B+1C)X.9 $ 469.33
   E. SALVAGE VALUE OF EXISTING EQUIPMENT $ —
   F. TOTAL INVESTMENT (1D-1E) $ 469.33

2. ENERGY SAVINGS (+) / COST (-)
   ANALYSIS DATE ANNUAL SAVINGS, UNIT COST $ DISCOUNTED SAVINGS

FUEL	COST \$/MBTU(1)	SAVINGS MBTU/YR(2)	ANNUAL \$ SAVINGS(3)	DISCOUNT FACTOR(4)	DISCOUNTED SAVINGS(5)
A. ELEC	\$19.92	4.212/unit	\$ 83.91	12.12	\$ 1017
B. DIST	\$		\$		\$
C. RESID	\$		\$		\$
D. NG	\$		\$		\$
E. COAL	\$		\$		\$
F. TOTAL			\$ 83.91		\$ 1017

3. NON ENERGY SAVINGS (+) / COST (-)
   A. ANNUAL RECURRING (+/-) $ 0
      (1) DISCOUNT FACTOR (TABLE 1) ______
      (2) DISCOUNTED SAVING/COST (3A X 3A1) $ 0

   B. NON RECURRING SAVINGS (+) / COST (-)

ITEM	SAVINGS \$ (+) COST \$ (-)(1)	YEAR OF OCCURRENCE(2)	DISCOUNT FACTOR (3)	DISCOUNTED SAVINGS (+) COST(-)(4)
a.	\$			\$
b.	\$			\$
c.	\$			\$
d. TOTAL	\$			\$

   C. TOTAL NON ENERGY DISCOUNTED SAVINGS (+) / COST (-) (3A2+3Bd4) $ 0

   D. PROJECT NON ENERGY QUALIFICATION TEST
   (1) 25% MAX NON ENERGY CALC (2F5 X .33) $ 335.61
      a. IF 3D1 IS = OR 3C GO TO ITEM 4
      b. IF 3D1 IS 3C CALC SIR = (2F5+3D1) : 1F = ______
      c. IF 3D1b IS = 1 GO TO ITEM 4
      d. IF 3D1b IS 1 PROJECT DOES NOT QUALIFY

4. FIRST YEAR DOLLAR SAVINGS 2F3+3A+(3B1d : YEARS ECONOMIC LIFE) $ 83.91

5. TOTAL NET DISCOUNTED SAVINGS (2F5+3C) $ 1017

6. SIR (IF 1 PROJECT DOES NOT QUALIFY) (SIR)=(5 : 1F)= 2.17

UNIT TYPE	LOCATION	LIGHTING SAVINGS(W)	HRS PER DAY OPERATION	DAILY SAVINGS (KWH)
57-II	L/R	180	6	1.080
& 57-IV	B/R 1	60	4	0.240
& 57-VI	B/R 2	60	4	0.240
& 57-VIII	B/R 3	60	4	0.240
& 57-IX	KIT.	75	4	0.300
	LAUND.	60	2	0.120
TOTAL			=	2.220 KWH/Day

Assuming that only 70% of the lamps can be replaced Total = 0.70 (2.220)

ANNUAL ENERGY SAVINGS = 1.554 KWH/DAY

= 1.554 KWH/Day × 365 Day/YR = 567 KWH/YR

ANNUAL COST SAVINGS

= 567 KWH/YR × ($0.068 /KWH) = $38.56

Cost for fluorescent adaptor = $ 370.00

(see attached)

Assuming that only 70% of the lamps can be replaced Total = .70 (370) = $259

$$\text{Payback} = \frac{\$\ 259}{\$\ 38.56\ /\text{YR}} = 6.7 \text{ yrs}$$

SIR = 1.73 (see attached)

CEDRIC D. O. CHONG & ASSOCIATES, INC.
CONSULTING MECHANICAL & ELECTRICAL ENGINEERS
2130-E North King Street Honolulu, Hawaii 96819
Telephone (808) 847-6557 Telefax: (808) 847-6550

DATE: JOB No.:

PROJECT NAME: BY:

SUBJECT: Sht. 3-46 Of

ABOR RATE : $21.81 + 75% LB = 38 SAY $38.20

PROJECT Replace Incadescent Lights							ESTIMATOR	CHECKED BY	SHEET OF		
TASK DESCRIPTION	QUANTITY		LABOR				EQUIPMENT		MATERIAL		TOTAL
Unit Type	NO. OF UNITS	UNIT MEAS	MH/UNIT	TOTAL HRS	UNIT PRICE	COST	UNIT PRICE	COST	UNIT PRICE	COST	
9w Fluores. Adaptor	0	EA	0.15		38.20				18		
11W Fluores. Adaptor	0	EA	0.15						20		
15W Fluores. Adaptor	10	EA	0.15	1.5		57.30			22	220	277.30
								Subtotal			277.30
								Profit	(10%)		27.73
								O/H	(15%)		45.75
								Tax	(4%)		14.03
								Bond	(1%)		3.65
								Total			368.46
NOTE :										SAY	$370.00
a) Mat'l cost quote w/											
Pelsa Lighting (524-3744)											
(Bobby Solomon)											

DA FORM 5418-R, Apr 85 CONTD

LIFE CYCLE COST ANALYSIS SUMMARY
ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP)

LOCATION: ______ REGION NO. ____ PROJECT NUMBER ______

PROJECT TITLE Replace Incadescent Lights FISCAL YEAR ______

DISCRETE PORTION NAME UNIT TYPE 57-II, IV, VI, VIII, IX

ANALYSIS DATE ______ ECONOMIC LIFE 25 YEARS PREPARED BY ____

1. INVESTMENT COSTS
   A. CONSTRUCTION COST $ 259.
   B. SIOH (5.5%) $ 14.25
   C. DESIGN COST (10%) $ 25.90
   D. ENERGY CREDIT CALC (1A+1B+1C)X.9 $ 269.24
   E. SALVAGE VALUE OF EXISTING EQUIPMENT $ —
   F. TOTAL INVESTMENT (1D-1E) $ 269.24

2. ENERGY SAVINGS (+) / COST (-)
   ANALYSIS DATE ANNUAL SAVINGS, UNIT COST $ DISCOUNTED SAVINGS

FUEL	COST $/MBTU(1)	SAVINGS MBTU/YR(2)	ANNUAL $ SAVINGS(3)	DISCOUNT FACTOR(4)	DISCOUNTED SAVINGS(5)
A. ELEC	$ 19.93	1.935/unit	$ 38.56	12.12	$ 467.35
B. DIST	$		$		$
C. RESID	$		$		$
D. NG	$		$		$
E. COAL	$		$		$
F. TOTAL			$ 38.56		$ 467.35

3. NON ENERGY SAVINGS (+) / COST (-)
   A. ANNUAL RECURRING (+/-) $ 0
      (1) DISCOUNT FACTOR (TABLE 1) ______
      (2) DISCOUNTED SAVING/COST (3A X 3A1) $ 0

   B. NON RECURRING SAVINGS (+) / COST (-)

ITEM	SAVINGS $ (+) COST $ (-)(1)	YEAR OF OCCURRENCE(2)	DISCOUNT FACTOR (3)	DISCOUNTED SAVINGS (+) COST(-)(4)
a.	$			$
b.	$			$
c.	$			$
d. TOTAL	$			$

   C. TOTAL NON ENERGY DISCOUNTED SAVINGS (+) / COST (-) (3A2+3Bd4) $ 0

   D. PROJECT NON ENERGY QUALIFICATION TEST
   (1) 25% MAX NON ENERGY CALC (2F5 X .33) $ 154.23
      a. IF 3D1 IS = OR 3C GO TO ITEM 4
      b. IF 3D1 IS 3C CALC SIR = (2F5+3D1) : 1F = ______
      c. IF 3D1b IS = 1 GO TO ITEM 4
      d. IF 3D1b IS 1 PROJECT DOES NOT QUALIFY

4. FIRST YEAR DOLLAR SAVINGS 2F3+3A+(3B1d : YEARS ECONOMIC LIFE) $ 38.56

5. TOTAL NET DISCOUNTED SAVINGS (2F5+3C) $ 467.35

6. SIR (IF 1 PROJECT DOES NOT QUALIFY) (SIR)=(5 : 1F)= 1.73

UNIT TYPE	LOCATION	LIGHTING SAVINGS(W)	HRS PER DAY OPERATION	DAILY SAVINGS (KWH)
57-III	LR	180	6	1.080
	B/R 1	45	4	0.180
	B/R 2	60	4	0.240
	B/R 3	60	4	0.240
	Laund.	60	2	0.120
TOTAL			=	1.860 KWH/Dy

Assuming that only 70% of the lamps can be replaced Total = .70 (1.860) = 1.302

ANNUAL ENERGY SAVINGS

= 1.302 KWH/Day × (365 Day/yr) = 475 KWH/yR

ANNUAL COST SAVINGS

= 475 KWH/yR × ($ 0.068 /KWH) = $ 32.30

Cost for Fluorescent adaptors = $ 260.00
(see attached)

Assuming that only 70% of the lamps can be replaced Total = .70(260) = $182

Payback = $ 182 / $ 32.30 /yR = 5.6 yrs

SIR = 2.06 (see attached)

EDRIC D. O. CHONG & ASSOCIATES, INC.
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Telephone (808) 847-6557 Telefax: (808) 847-6550

DATE: JOB No.:
PROJECT NAME: BY:
SUBJECT:

LABOR RATE : $21.81 + 75% LB = 38 SAY $38.20

PROJECT: Replace Incadescent Lights

ESTIMATOR | CHECKED BY | SHEET OF SHEETS

TASK DESCRIPTION	QUANTITY		LABOR				EQUIPMENT		MATERIAL		TOTAL
	NO. OF UNITS	UNIT MEAS	MH/UNIT	TOTAL HRS	UNIT PRICE	COST	UNIT PRICE	COST	UNIT PRICE	COST	
Unit Type 57-III											
9w Fluores. Adaptor	0	EA	0.15	0	38.20				18		
11W Fluores. Adaptor	0	EA	0.15	0					20		
15W Fluores. Adaptor	7	EA	0.15	1.05		40.11			22	154	194.11
								Subtotal			194.11
								Profit	(10%)		19.41
								O/H	(15%)		32.03
								Tax	(4%)		9.82
								Bond	(1%)		2.55
								Total			257.92
										SAY	$260.00
NOTE:											
a) Mat'l cost quote w/											
Pelsa Lighting (524-3744)											
(Bobby Solomon)											

DA FORM 5418-R, Apr 85 CONTD

LIFE CYCLE COST ANALYSIS SUMMARY
ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP)

LOCATION: ______ REGION NO. ____ PROJECT NUMBER ______

PROJECT TITLE Replace Incadescent Lights FISCAL YEAR ______

DISCRETE PORTION NAME UNIT TYPE 57-III

ANALYSIS DATE ______ ECONOMIC LIFE 25 YEARS PREPARED BY ______

1. INVESTMENT COSTS
   A. CONSTRUCTION COST $ 182
   B. SIOH (5.5%) $ 10.01
   C. DESIGN COST (10%) $ 18.20
   D. ENERGY CREDIT CALC (1A+1B+1C)X.9 $ 189.19
   E. SALVAGE VALUE OF EXISTING EQUIPMENT $ —
   F. TOTAL INVESTMENT (1D-1E) $ 189.19

2. ENERGY SAVINGS (+) / COST (-)
   ANALYSIS DATE ANNUAL SAVINGS, UNIT COST $ DISCOUNTED SAVINGS

FUEL	COST $/MBTU(1)	SAVINGS MBTU/YR(2)	ANNUAL $ SAVINGS(3)	DISCOUNT FACTOR(4)	DISCOUNTED SAVINGS(5)
A. ELEC	$ 19.93	1.621/unit	$ 32.20	12.12	$ 390.26
B. DIST	$		$		$
C. RESID	$		$		$
D. NG	$		$		$
E. COAL	$		$		$
F. TOTAL			$ 32.20		$ 390.26

3. NON ENERGY SAVINGS (+) / COST (-)
   A. ANNUAL RECURRING (+/-) $ 0
      (1) DISCOUNT FACTOR (TABLE 1) ______
      (2) DISCOUNTED SAVING/COST (3A X 3A1) $ 0

   B. NON RECURRING SAVINGS (+) / COST (-)

ITEM	SAVINGS $ (+) COST $ (-)(1)	YEAR OF OCCURRENCE(2)	DISCOUNT FACTOR (3)	DISCOUNTED SAVINGS (+) COST(-)(4)
a.	$			$
b.	$			$
c.	$			$
d. TOTAL	$			$

   C. TOTAL NON ENERGY DISCOUNTED SAVINGS (+) / COST (-) (3A2+3Bd4) $ 0

   D. PROJECT NON ENERGY QUALIFICATION TEST
   (1) 25% MAX NON ENERGY CALC (2F5 X .33) $ 128.79
      a. IF 3D1 IS = OR 3C GO TO ITEM 4
      b. IF 3D1 IS 3C CALC SIR = (2F5+3D1) : 1F = ______
      c. IF 3D1b IS = 1 GO TO ITEM 4
      d. IF 3D1b IS 1 PROJECT DOES NOT QUALIFY

4. FIRST YEAR DOLLAR SAVINGS 2F3+3A+(3B1d : YEARS ECONOMIC LIFE) $ 32.20

5. TOTAL NET DISCOUNTED SAVINGS (2F5+3C) $ 390.26

6. SIR (IF 1 PROJECT DOES NOT QUALIFY) (SIR)=(5 : 1F)= 2.06

UNIT TYPE	LOCATION	LIGHTING SAVINGS(W)	HRS PER DAY OPERATION	DAILY SAVINGS (KWH)
57-V	L/R	180	6	1.080
& 57-VII	B/R	60	4	0.240
	B/R	60	4	0.240
	LAUND	60	2	0.120
TOTAL				= 1.680 KWH/Day

Assuming that only 70% of the lamps can be replaced Total = 1.680 (.70)
= 1.176 KWH/Day

ANNUAL ENERGY SAVINGS
= 1.176 KWH/Day × (365 Day/yR) = 429 KWH/yR

ANNUAL COST SAVINGS
= 429 KWH/yR × ($0.068 /yR) = $29.17

Cost for fluorescent adaptor = $220
(see attached)

Assuming that only 70% of the lamps can be replaced Total = 220(.70) = $154

$$\text{Payback} = \frac{\$154}{\$29.17\ /\text{yR}} = 5.3 \text{ yrs}$$

SIR = 2.20 (see attached)

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Telephone (808) 847-6557 Telefax: (808) 847-6550

DATE: JOB No.:
PROJECT NAME: BY:
SUBJECT:

LABOR RATE : $21.81 + 75% LB = 38 SAY $38.20

PROJECT Replace Incadescent Lights							ESTIMATOR	CHECKED BY	SHEET OF		SHEETS
	QUANTITY		LABOR				EQUIPMENT		MATERIAL		
TASK DESCRIPTION Unit Type 57-V 9 VII	NO. OF UNITS	UNIT MEAS	MH/UNIT	TOTAL HRS	UNIT PRICE	COST	UNIT PRICE	COST	UNIT PRICE	COST	TOTAL
9w Fluores. Adaptor	0	EA	0.15		38.20				18		
11W Fluores. Adaptor	0	EA	0.15						20		
15W Fluores. Adaptor	6	EA	0.15	0.90	↓	34.38			22	132	166.38
								Subtotal			166.38
								Profit	(10%)		16.64
								O/H	(15%)		27.45
								Tax	(4%)		8.42
								Bond	(1%)		2.19
								Total			221.08
NOTE :										SAY	$220
a) Mat'l cost quote w/											
Pelsa Lighting (524-3744)											
(Bobby Solomon)											

DA FORM 5418-R, Apr 85 CONTD

LIFE CYCLE COST ANALYSIS SUMMARY
ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP)

LOCATION:________ REGION NO.____ PROJECT NUMBER________

PROJECT TITLE Replace Incadescent Lights FISCAL YEAR________

DISCRETE PORTION NAME UNIT TYPE 57-VI, 57-VII

ANALYSIS DATE ________ ECONOMIC LIFE 25 YEARS PREPARED BY ____

1. INVESTMENT COSTS
   - A. CONSTRUCTION COST — $ 154
   - B. SIOH (5.5%) — $ 8.47
   - C. DESIGN COST (10%) — $ 15.4
   - D. ENERGY CREDIT CALC (1A+1B+1C)X.9 — $ 160.08
   - E. SALVAGE VALUE OF EXISTING EQUIPMENT — $ —
   - F. TOTAL INVESTMENT (1D-1E) — $ 160.08

2. ENERGY SAVINGS (+) / COST (-)
   ANALYSIS DATE ANNUAL SAVINGS, UNIT COST $ DISCOUNTED SAVINGS

FUEL	COST $/MBTU(1)	SAVINGS MBTU/YR(2)	ANNUAL $ SAVINGS(3)	DISCOUNT FACTOR(4)	DISCOUNTED SAVINGS(5)
A. ELEC	$ 19.92	1.464/unit	$ 29.17	12.12	$ 353.54
B. DIST	$		$		$
C. RESID	$		$		$
D. NG	$		$		$
E. COAL	$		$		$
F. TOTAL			$ 29.17		$ 353.54

3. NON ENERGY SAVINGS (+) / COST (-)
   - A. ANNUAL RECURRING (+/-) — $ 0
     - (1) DISCOUNT FACTOR (TABLE 1) ____
     - (2) DISCOUNTED SAVING/COST (3A X 3A1) — $ 0
   - B. NON RECURRING SAVINGS (+) / COST (-)

ITEM	SAVINGS $ (+) COST $ (-)(1)	YEAR OF OCCURRENCE(2)	DISCOUNT FACTOR (3)	DISCOUNTED SAVINGS (+) COST(-)(4)
a.	$			$
b.	$			$
c.	$			$
d. TOTAL	$			$

   - C. TOTAL NON ENERGY DISCOUNTED SAVINGS (+) / COST (-) (3A2+3Bd4) $ 0
   - D. PROJECT NON ENERGY QUALIFICATION TEST
     - (1) 25% MAX NON ENERGY CALC (2F5 X .33) — $ 116.67
       - a. IF 3D1 IS = OR 3C GO TO ITEM 4
       - b. IF 3D1 IS 3C CALC SIR = (2F5+3D1) : 1F = ____
       - c. IF 3D1b IS = 1 GO TO ITEM 4
       - d. IF 3D1b IS 1 PROJECT DOES NOT QUALIFY

4. FIRST YEAR DOLLAR SAVINGS 2F3+3A+(3B1d : YEARS ECONOMIC LIFE) $ 29.17

5. TOTAL NET DISCOUNTED SAVINGS (2F5+3C) $ 353.54

6. SIR (IF 1 PROJECT DOES NOT QUALIFY) (SIR)=(5 : 1F)= 2.20

UNIT TYPE	LOCATION	LIGHTING SAVINGS (W)	HRS PER DAY OPERATION	DAILY SAVINGS (KWH)
60-I	L/R	45	6	0.270

Assuming that only 70% of the bulbs can be replaced Total = .270 × .70 = 0.189 KWH

ANNUAL ENERGY SAVINGS

= 0.189 KWH/Day × 365 Day/yr = 69 KWH/YR

ANNUAL COST SAVINGS

= 69 KWH/YR × ($0.068/KWH) = $4.69

Cost for fluorescent Adaptor = $ 37.00
(see attached)

Assuming that only 70% of the bulbs can be replaced Total = 37.00(.7) = 25.90

Payback = $ 25.90 / $ 4.69 /YR = 5.5 yrs

SIR = 2.11 (see attached)

CEDRIC D. O. CHONG & ASSOCIATES, INC.
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2130-E North King Street Honolulu, Hawaii 96819
Telephone (808) 847-6557 Telefax: (808) 847-6550

DATE: JOB No.:
PROJECT NAME: BY:
SUBJECT: Sht. Of 3-55

ABOR RATE : $21.81 + 75% LB = 38. SAY $38.20

PROJECT eplace Incadescent Lights | ESTIMATOR | CHECKED BY | SHEET OF S

TASK DESCRIPTION	QUANTITY		LABOR				EQUIPMENT		MATERIAL		TOTAL
	NO. OF UNITS	UNIT MEAS	MH/UNIT	TOTAL HRS	UNIT PRICE	COST	UNIT PRICE	COST	UNIT PRICE	COST	
Unit type 60-I											
9w Fluores. Adaptor	0	EA	0.15		38.2				18		
11W Fluores. Adaptor	0	EA	0.15						20		
15W Fluores. Adaptor	1	EA	0.15	0.15		5.73			22	22	27.73
								Subtotal			27.73
								Profit	(10%)		2.77
								O/H	(15%)		4.56
								Tax	(4%)		1.40
								Bond	(1%)		0.36
								Total			36.82
NOTE:										SAY	$37.00
a) Mat'l cost quote w/											
Pelsa Lighting (524-3144)											
(Bobby Solomon)											

DA FORM 5418-R, Apr 85 CONTD

LIFE CYCLE COST ANALYSIS SUMMARY
ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP)

LOCATION:______________ REGION NO.____ PROJECT NUMBER______________

PROJECT TITLE Replace Incadescent Lights FISCAL YEAR__________

DISCRETE PORTION NAME UNIT TYPE 60-I

ANALYSIS DATE ______________ ECONOMIC LIFE 25 YEARS PREPARED BY _____

1. INVESTMENT COSTS
   A. CONSTRUCTION COST $ 25.90
   B. SIOH (5.5%) $ 1.42
   C. DESIGN COST (10%) $ 2.59
   D. ENERGY CREDIT CALC (1A+1B+1C)X.9 $ 26.92
   E. SALVAGE VALUE OF EXISTING EQUIPMENT $
   F. TOTAL INVESTMENT (1D-1E) $ 26.92

2. ENERGY SAVINGS (+) / COST (-)
   ANALYSIS DATE ANNUAL SAVINGS, UNIT COST $ DISCOUNTED SAVINGS

FUEL	COST $/MBTU(1)	SAVINGS MBTU/YR(2)	ANNUAL $ SAVINGS(3)	DISCOUNT FACTOR(4)	DISCOUNTED SAVINGS(5)
A. ELEC	$ 19.91	0.235/unit	$ 4.69	12.12	$ 56.84
B. DIST	$		$		$
C. RESID	$		$		$
D. NG	$		$		$
E. COAL	$		$		$
F. TOTAL			$ 4.69		$ 56.84

3. NON ENERGY SAVINGS (+) / COST (-)
   A. ANNUAL RECURRING (+/-) $ 0
      (1) DISCOUNT FACTOR (TABLE 1) _____
      (2) DISCOUNTED SAVING/COST (3A X 3A1) $ 0

   B. NON RECURRING SAVINGS (+) / COST (-)

ITEM	SAVINGS $ (+) COST $ (-)(1)	YEAR OF OCCURRENCE(2)	DISCOUNT FACTOR (3)	DISCOUNTED SAVINGS (+) COST(-)(4)
a.	$			$
b.	$			$
c.	$			$
d. TOTAL	$			$

   C. TOTAL NON ENERGY DISCOUNTED SAVINGS (+) / COST (-) (3A2+3Bd4) $ 0

   D. PROJECT NON ENERGY QUALIFICATION TEST
   (1) 25% MAX NON ENERGY CALC (2F5 X .33) $ 18.76
      a. IF 3D1 IS = OR 3C GO TO ITEM 4
      b. IF 3D1 IS 3C CALC SIR = (2F5+3D1) : 1F = _______
      c. IF 3D1b IS = 1 GO TO ITEM 4
      d. IF 3D1b IS 1 PROJECT DOES NOT QUALIFY

4. FIRST YEAR DOLLAR SAVINGS 2F3+3A+(3B1d : YEARS ECONOMIC LIFE) $ 4.69

5. TOTAL NET DISCOUNTED SAVINGS (2F5+3C) $ 56.84

6. SIR (IF 1 PROJECT DOES NOT QUALIFY) (SIR)=(5 : 1F)= 2.11

UNIT TYPE	LOCATION	LIGHTING SAVINGS (W)	HRS PER DAY OPER	DAILY SAVINGS
60-II	L/R	45	6	.270 KWH/Dy

Assuming that only 70% of the lamps can be replaced Total = .270 (.70) = 0.189

ANNUAL ENERGY SAVINGS

= 0.189 KWH/Day x 365 Day/yr = 69 KWH/yr

ANNUAL COST SAVINGS

= 69 KWH/yr x ($ 0.068 /KWH) = $ 4.69

Cost for fluorescent adapter = $ 37.00
(see attached)

Assuming that only 70% of the lamps can be replaced Total = 37.00 (.70) = $ 25.90

$$\text{Payback} = \frac{\$\ 25.90}{\$\ 4.69\ /yr} = 5.5 \text{ yrs}$$

SIR = 2.11 (see attached)

CEDRIC D. O. CHONG & ASSOCIATES, INC.
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2130-E North King Street Honolulu, Hawaii 96819
Telephone (808) 847-6557 Telefax: (808) 847-6550

DATE: JOB No.:
PROJECT NAME: BY:
SUBJECT:

ABOR RATE : $21.81 + 75% LB = 38. SAY $38.20

PROJECT eplace Incadescent Lights							ESTIMATOR	CHECKED BY	SHEET	OF	S
	QUANTITY		LABOR				EQUIPMENT		MATERIAL		
TASK DESCRIPTION Unit type	NO. OF UNITS	UNIT MEAS	MH/UNIT	TOTAL HRS	UNIT PRICE	COST	UNIT PRICE	COST	UNIT PRICE	COST	TOTAL
9w Fluores. Adaptor	0	EA	0.15		38.20				18		
11w Fluores. Adaptor	0	EA	0.15						20		
15w Fluores. Adaptor	1	EA	0.15	0.15		5.73			22	22	27.73
								Subtotal			27.73
								Profit	(10%)		2.77
								O/H	(15%)		4.56
								Tax	(4%)		1.40
								Bond	(1%)		0.36
								Total			36.82
NOTE :										SAY	$37.00
a) Mat'l cost quote w/											
Pelsa Lighting (524-3144)											
(Bobby Solomon)											

DA FORM 5418-R, Apr 85 CONTD

LIFE CYCLE COST ANALYSIS SUMMARY
ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP)

LOCATION: ________ REGION NO. ____ PROJECT NUMBER ________

PROJECT TITLE Replace Incadescent Lights FISCAL YEAR ________

DISCRETE PORTION NAME UNIT TYPE 60-II 0

ANALYSIS DATE ________ ECONOMIC LIFE 25 YEARS PREPARED BY ____

1. INVESTMENT COSTS
   A. CONSTRUCTION COST $ 25.90
   B. SIOH (5.5%) $ 1.42
   C. DESIGN COST (10%) $ 2.59
   D. ENERGY CREDIT CALC (1A+1B+1C)X.9 $ 26.92
   E. SALVAGE VALUE OF EXISTING EQUIPMENT $ ____
   F. TOTAL INVESTMENT (1D-1E) $ 26.92

2. ENERGY SAVINGS (+) / COST (-)
   ANALYSIS DATE ANNUAL SAVINGS, UNIT COST $ DISCOUNTED SAVINGS

FUEL	COST $/MBTU(1)	SAVINGS MBTU/YR(2)	ANNUAL $ SAVINGS(3)	DISCOUNT FACTOR(4)	DISCOUNTED SAVINGS(5)
A. ELEC	$ 19.91	0.235/unit	$ 4.69	12.12	$ 56.84
B. DIST	$		$		$
C. RESID	$		$		$
D. NG	$		$		$
E. COAL	$		$		$
F. TOTAL			$ 4.69		$ 56.84

3. NON ENERGY SAVINGS (+) / COST (-)
   A. ANNUAL RECURRING (+/-) $ 0
      (1) DISCOUNT FACTOR (TABLE 1) ____
      (2) DISCOUNTED SAVING/COST (3A X 3A1) $ 0

   B. NON RECURRING SAVINGS (+) / COST (-)

ITEM	SAVINGS $ (+) COST $ (-)(1)	YEAR OF OCCURRENCE(2)	DISCOUNT FACTOR (3)	DISCOUNTED SAVINGS (+) COST(-)(4)
a.	$			$
b.	$			$
c.	$			$
d. TOTAL	$			$

   C. TOTAL NON ENERGY DISCOUNTED SAVINGS (+) / COST (-) (3A2+3Bd4) $ ____

   D. PROJECT NON ENERGY QUALIFICATION TEST
   (1) 25% MAX NON ENERGY CALC (2F5 X .33) $ 18.76
      a. IF 3D1 IS = OR 3C GO TO ITEM 4
      b. IF 3D1 IS 3C CALC SIR = (2F5+3D1) : 1F = ____
      c. IF 3D1b IS = 1 GO TO ITEM 4
      d. IF 3D1b IS 1 PROJECT DOES NOT QUALIFY

4. FIRST YEAR DOLLAR SAVINGS 2F3+3A+(3B1d : YEARS ECONOMIC LIFE) $ 4.69

5. TOTAL NET DISCOUNTED SAVINGS (2F5+3C) $ 56.84

6. SIR (IF 1 PROJECT DOES NOT QUALIFY) (SIR)=(5 : 1F)= 2.11

UNIT TYPE	LOCATION	LIGHTING SAVINGS (W)	HRS PER DAY OPER	DAILY SAVINGS
60-III	L/R	45	6	270 KWH/Day

Assuming that only 70% of the lamps can be replaced Total = 0.70(270) = .189 KWH/Day

ANNUAL ENERGY SAVINGS

= 0.189 KWH/Day x 365 Day/yr = 69 KWH/yr

ANNUAL COST SAVINGS

= 69 KWH/yr x ($0.068/KWH) = $4.69

Cost for fluorescent adapter = $ 37.00
(see attached)

Assuming that only 70% of the lamps can be replaced Total = 0.70(37) = $25.90

$$\text{Payback} = \frac{\$\ 25.90}{\$\ 4.69\ /yr} = 5.5\ yrs$$

SIR = 2.11 (see attached)

CEDRIC D. O. CHONG & ASSOCIATES, INC.
CONSULTING MECHANICAL & ELECTRICAL ENGINEERS
2130-E North King Street Honolulu, Hawaii 96819
Telephone (808) 847-6557 Telefax: (808) 847-6550

DATE: JOB No.:
PROJECT NAME: BY:
SUBJECT:

ABOR RATE : $21.81 + 75% LB = 38. SAY $38.20

PROJECT eplace Incadescent Lights | ESTIMATOR | CHECKED BY | SHEET OF S

TASK DESCRIPTION	QUANTITY		LABOR				EQUIPMENT		MATERIAL		TOTAL
	NO. OF UNITS	UNIT MEAS	MH/UNIT	TOTAL HRS	UNIT PRICE	COST	UNIT PRICE	COST	UNIT PRICE	COST	
Unit Type											
9w Fluores. Adaptor	0	EA	0.15		38.20				18		
11W Fluores. Adaptor	0	EA	0.15						20		
15W Fluores. Adaptor	1	EA	0.15	0.15		5.73			22	22	27.73
								Subtotal			27.73
								Profit	(10%)		2.77
								O/H	(15%)		4.56
								Tax	(4%)		1.46
								Bond	(1%)		0.36
								Total			36.82
										SAY	$37.00
NOTE :											
a) Mat'l cost quote w/											
Pelsa Lighting (524-3744)											
(Bobby Solomon)											

DA FORM 5418-R, Apr 85 CONTD

LIFE CYCLE COST ANALYSIS SUMMARY
ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP)

LOCATION: ______ REGION NO. ___ PROJECT NUMBER ______

PROJECT TITLE Replace Incadescent Lights FISCAL YEAR ______

DISCRETE PORTION NAME UNIT TYPE 60-IIIC

ANALYSIS DATE ______ ECONOMIC LIFE 25 YEARS PREPARED BY ____

1. INVESTMENT COSTS
   A. CONSTRUCTION COST $ 25.90
   B. SIOH (5.5%) $ 1.42
   C. DESIGN COST (10%) $ 2.59
   D. ENERGY CREDIT CALC (1A+1B+1C)X.9 $ 26.92
   E. SALVAGE VALUE OF EXISTING EQUIPMENT $ —
   F. TOTAL INVESTMENT (1D-1E) $ 26.92

2. ENERGY SAVINGS (+) / COST (-)
   ANALYSIS DATE ANNUAL SAVINGS, UNIT COST $ DISCOUNTED SAVINGS

FUEL	COST $/MBTU(1)	SAVINGS MBTU/YR(2)	ANNUAL $ SAVINGS(3)	DISCOUNT FACTOR(4)	DISCOUNTED SAVINGS(5)
A. ELEC	$19.91	0.235/unit	$ 4.69	12.12	$ 56.84
B. DIST	$		$		$
C. RESID	$		$		$
D. NG	$		$		$
E. COAL	$		$		$
F. TOTAL			$ 4.69		$ 56.84

3. NON ENERGY SAVINGS (+) / COST (-)
   A. ANNUAL RECURRING (+/-) $ 0
      (1) DISCOUNT FACTOR (TABLE 1) ______
      (2) DISCOUNTED SAVING/COST (3A X 3A1) $ 0

   B. NON RECURRING SAVINGS (+) / COST (-)

ITEM	SAVINGS $ (+) COST $ (-)(1)	YEAR OF OCCURRENCE(2)	DISCOUNT FACTOR (3)	DISCOUNTED SAVINGS (+) COST(-)(4)
a.	$			$
b.	$			$
c.	$			$
d. TOTAL	$			$

   C. TOTAL NON ENERGY DISCOUNTED SAVINGS (+) / COST (-) (3A2+3Bd4) $ 0

   D. PROJECT NON ENERGY QUALIFICATION TEST
   (1) 25% MAX NON ENERGY CALC (2F5 X .33) $ 18.76
      a. IF 3D1 IS = OR 3C GO TO ITEM 4
      b. IF 3D1 IS 3C CALC SIR = (2F5+3D1) : 1F = ______
      c. IF 3D1b IS = 1 GO TO ITEM 4
      d. IF 3D1b IS 1 PROJECT DOES NOT QUALIFY

4. FIRST YEAR DOLLAR SAVINGS 2F3+3A+(3B1d : YEARS ECONOMIC LIFE) $ 4.69

5. TOTAL NET DISCOUNTED SAVINGS (2F5+3C) $ 56.84

6. SIR (IF 1 PROJECT DOES NOT QUALIFY) (SIR)=(5 : 1F)= 2.11

UNIT TYPE	LOCATION	LIGHTING SAVINGS (W)	HRS PER DAY OPER	DAILY SAVINGS
71-I	L/R	60	6	0.360

Assuming that only 70% of the lamps can be replaced Total = .70(.360) = .252 KWH/day

ANNUAL ENERGY SAVINGS

= 0.252 KWH/Day x 365 Day/yr = 92 KWH/yr

ANNUAL COST SAVINGS

= 92 KWH/yr x ($0.068/KWH) = $6.26

Cost for fluorescent adapter = $37.00
(see attached)

Assuming that only 70% of the lamps can be replaced Total = .70(37) = 25.90

$$\text{Payback} = \frac{\$\ 25.90}{\$\ 6.26\ /yr} = 4.1\ \text{yrs}$$

SIR = 2.81 (see attached)

CEDRIC D. O. CHONG & ASSOCIATES, INC.
CONSULTING MECHANICAL & ELECTRICAL ENGINEERS
2130-E North King Street Honolulu, Hawaii 96819
Telephone (808) 847-6557 Telefax: (808) 847-6550

DATE: JOB No.:

PROJECT NAME: BY:

SUBJECT:

ABOR RATE : $21.81 + 75% LB = 38. SAY $38.20

PROJECT Replace Incadescent Lights								ESTIMATOR	CHECKED BY	SHEET OF	
TASK DESCRIPTION	QUANTITY		LABOR				EQUIPMENT		MATERIAL		TOTAL
Unit Type 71-I	NO. OF UNITS	UNIT MEAS	MH/UNIT	TOTAL HRS	UNIT PRICE	COST	UNIT PRICE	COST	UNIT PRICE	COST	
9W Fluores. Adaptor	0	EA	0.15		38.20				18		
11W Fluores. Adaptor	0	EA	0.15						20		
15W Fluores. Adaptor	1	EA	0.15	0.15		5.73			22	22	27.73
								Subtotal			27.73
								Profit	(10%)		2.77
								O/H	(15%)		4.56
								Tax	(4%)		1.40
								Bond	(1%)		0.36
								Total			36.82
NOTE :										SAY	$37.00
a) Mat'l cost quote w/											
Pelsa Lighting (524-3744)											
(Bobby Solomon)											

DA FORM 5418-R, Apr 85 CONTD

LIFE CYCLE COST ANALYSIS SUMMARY
ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP)

LOCATION:________ REGION NO.____ PROJECT NUMBER________

PROJECT TITLE Replace Incadescent Lights FISCAL YEAR________

DISCRETE PORTION NAME UNIT TYPE 71-I d

ANALYSIS DATE ________ ECONOMIC LIFE 25 YEARS PREPARED BY ____

1. INVESTMENT COSTS
   A. CONSTRUCTION COST $ 25.90
   B. SIOH (5.5%) $ 1.42
   C. DESIGN COST (10%) $ 2.59
   D. ENERGY CREDIT CALC (1A+1B+1C)X.9 $ 26.92
   E. SALVAGE VALUE OF EXISTING EQUIPMENT $
   F. TOTAL INVESTMENT (1D-1E) $ 26.92

2. ENERGY SAVINGS (+) / COST (-)
   ANALYSIS DATE ANNUAL SAVINGS, UNIT COST $ DISCOUNTED SAVINGS

FUEL	COST $/MBTU(1)	SAVINGS MBTU/YR(2)	ANNUAL $ SAVINGS(3)	DISCOUNT FACTOR(4)	DISCOUNTED SAVINGS(5)
A. ELEC	$ 19.93	0.314/unit	$ 6.26	12.12	$ 75.87
B. DIST	$		$		$
C. RESID	$		$		$
D. NG	$		$		$
E. COAL	$		$		$
F. TOTAL			$ 6.26		$ 75.87

3. NON ENERGY SAVINGS (+) / COST (-)
   A. ANNUAL RECURRING (+/-) $ 0
      (1) DISCOUNT FACTOR (TABLE 1) ____
      (2) DISCOUNTED SAVING/COST (3A X 3A1) $ 0

   B. NON RECURRING SAVINGS (+) / COST (-)

ITEM	SAVINGS $ (+) COST $ (-)(1)	YEAR OF OCCURRENCE(2)	DISCOUNT FACTOR (3)	DISCOUNTED SAVINGS (+) COST(-)(4)
a.	$			$
b.	$			$
c.	$			$
d. TOTAL	$			$

   C. TOTAL NON ENERGY DISCOUNTED SAVINGS (+) / COST (-) (3A2+3Bd4) $ 0

   D. PROJECT NON ENERGY QUALIFICATION TEST
   (1) 25% MAX NON ENERGY CALC (2F5 X .33) $ 25.04
      a. IF 3D1 IS = OR 3C GO TO ITEM 4
      b. IF 3D1 IS 3C CALC SIR = (2F5+3D1) : 1F = ____
      c. IF 3D1b IS = 1 GO TO ITEM 4
      d. IF 3D1b IS 1 PROJECT DOES NOT QUALIFY

4. FIRST YEAR DOLLAR SAVINGS 2F3+3A+(3B1d : YEARS ECONOMIC LIFE) $ 6.26

5. TOTAL NET DISCOUNTED SAVINGS (2F5+3C) $ 75.87

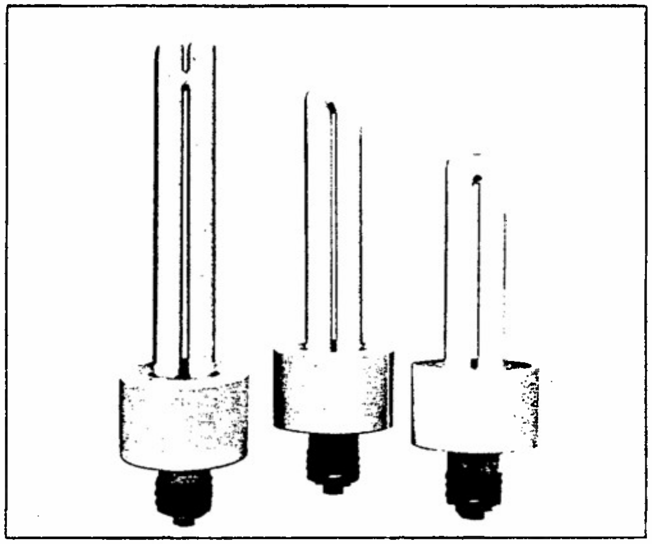
6. SIR (IF 1 PROJECT DOES NOT QUALIFY) (SIR)=(5 : 1F)= 2.81

SPECIFICATION GUIDE

EASTROCK TECHNOLOGY, INC.

The Leading Edge In Lighting Technology

OPTIMUM PERFORMANCE "ER" ADAPTERS*



Reduce energy costs by 75% with EASTROCK TECHNOLOGY'S Compact Fluorescent Adapters.* Optimum Performance Adapter's are designed to operate ALL BRANDS of Compact Fluorescent Lamps within Manufacturer's specifications. EASTROCK'S unique potted double C-Core ballast design allows for the lamp to seat within the case yielding the shortest installed height. Also available with a tapered lamp harp base.

*Patent Pending

UL UNDERWRITERS LABORATORIES INC. LISTED

APPLICATIONS:

Optimum Performance "ER" Adapters* are recommended for use where energy guzzling incandescent lamps are in use and energy savings and maintenance cost reductions are required.

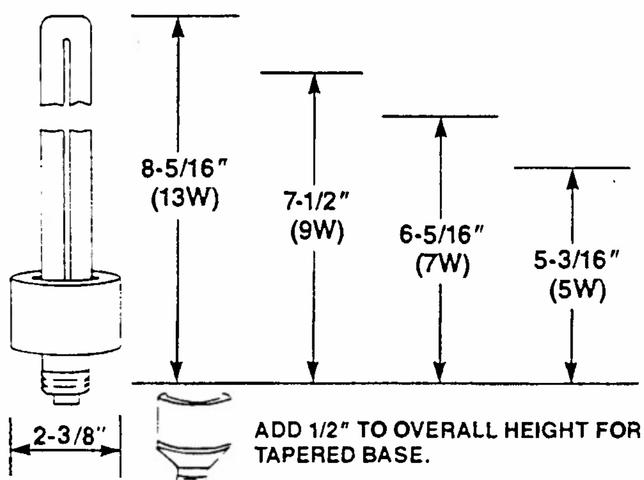
- Schools
- Hospitals
- Hotel/Motels
- Apartment Complexes
- Residences
- Restaurants
- Industrial Complexes
- Office Buildings
- Convenience Stores
- Retailers
- Shopping Centers
- Museums
- And Many Others . . .

SPECIFICATIONS:

1. **ADAPTER SYSTEM:** Shall contain a C-Core ballast constructed of grain oriented silicone steel wound with A insulated copper wire and inserted into a Valox® 855 (360°) case. The case is to be filled with enhanced potting epoxy and sonic-welded to insure durable life. Ballast shall operate all brands of Compact Fluorescent Lamps within manufacturer's specifications.
2. **LAMP RECEPTACLE:** Shall allow the lamp to seat within the adapter case where a spring clamp secures the lamp in place.
3. **ADAPTER BASE:** Shall be a self-ratcheting, medium brass base to prevent overtightening.
4. **COMPATIBLE LAMPS:** The Optimum Performance Adapters will accept specific wattage lamps manufactured by Philips, G.E., Sylvania, and Osram.

DIMENSIONS: (Overall Height)*

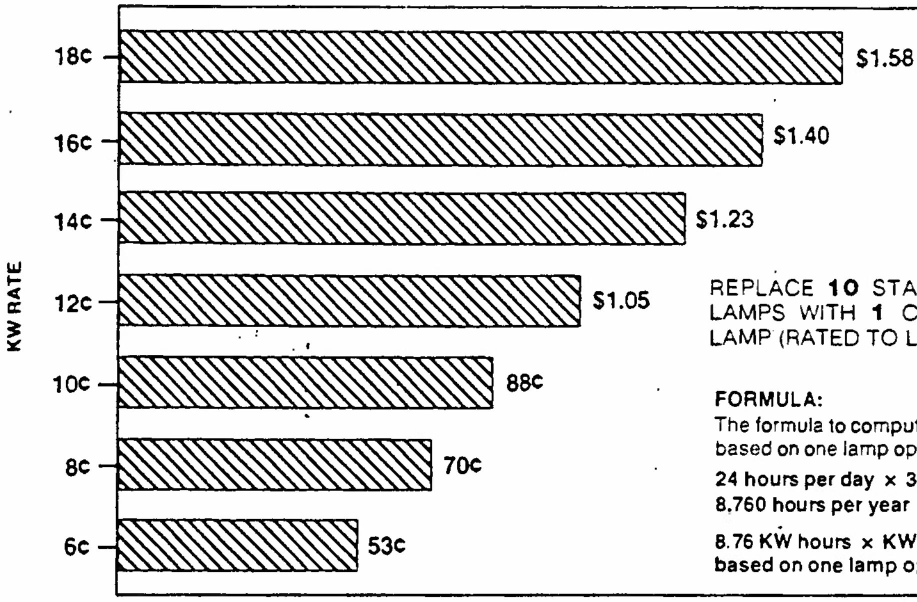
* May vary according to different lamp manufacturers.

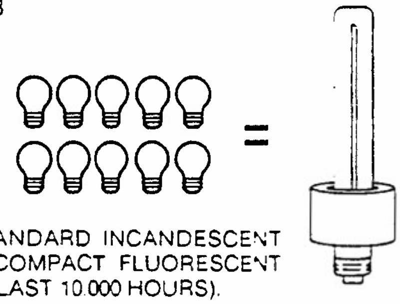


ADD 1/2" TO OVERALL HEIGHT FOR TAPERED BASE.

3-67

ANNUAL COST FOR ONE WATT OF ENERGY





REPLACE **10** STANDARD INCANDESCENT LAMPS WITH **1** COMPACT FLUORESCENT LAMP (RATED TO LAST 10,000 HOURS).

FORMULA:
The formula to compute the annual cost on one watt of energy based on one lamp operating 24 hours per day for 365 days is:

24 hours per day × 365 days = 8,760 hours per year
8,760 hours per year ÷ 1,000 hours = 8.76 kilowatt hours

8.76 KW hours × KW rate = annual cost for one watt based on one lamp operating 24 hours per day for 365 days.

Annual cost for one watt for 24 hour operation.

ANNUAL ENERGY SAVINGS WITH EASTROCK TECHNOLOGY

ADAPTER SYSTEM WATTAGE	INCANDESCENT REPLACEMENT WATTAGE	ENERGY SAVINGS	† ANNUAL ENERGY SAVINGS BY KWH RATE							
			6c	8c	10c	12c	14c	16c	18c	SYSTEM PAYBACK
7 W	25 W	18 W	9.54	12.60	15.84	18.90	22.14	25.20	28.44	6 Mo. - 18 Mo.
9 W	40 W	31 W	16.43	21.70	27.28	32.55	38.13	43.40	48.98	4 Mo. - 12 Mo.
11 W	60 W	49 W	25.97	34.30	43.12	51.45	60.27	68.60	77.42	3 Mo. - 7 Mo.
15 W	75 W	60 W	31.80	42.00	52.80	63.00	73.80	84.00	94.80	2 Mo. - 6 Mo.

† Based on 24 hours per day operation, 365 days.

ORDERING INFORMATION: Add T for tapered lamp harp base — Example: ERT-9

CATALOG NUMBER	DESCRIPTION	LAMP WATTAGE	SYSTEM WATTAGE	LUMENS	INCANDESCENT EQUIVALENT	OVERALL HEIGHT
ER 5	5 WATT ADAPTER	5W	7W	250	25W	5-3/16"
ER 7	7 WATT ADAPTER	7W	9W	400	40W	6-5/16"
ER 9	9 WATT ADAPTER	9W	11W	600	60W	7-1/2"
ER 13	13 WATT ADAPTER	13W	15W	900	75W	8-5/16"

LIMITED WARRANTY: All adapter systems manufactured by EASTROCK TECHNOLOGY, INC are warranted to be free from defects in workmanship and materials, as manufactured, for a period of two full years from date of manufacture.
Our warranty covers only replacement or repair at our factory or authorized repair facility of the defective part(s), to the original purchaser, and excludes any responsibility for labor or freight expense incurred by the purchaser or others for servicing any such claim during the warranty period.
EASTROCK TECHNOLOGY, INC reserves the right to issue credit, repair or replace the defective merchandise, at our option, upon receipt of written notification by the purchaser of the alleged defect, within the warranty period. EASTROCK TECHNOLOGY, INC further reserves the right to examination of the alleged defective product, or other proof, satisfactory to EASTROCK TECHNOLOGY, INC of the defect.
This limited warranty is in lieu of all other warranties, expressed or implied. EASTROCK TECHNOLOGY, INC assumes no responsibility for labor costs in connection with the installation, removal or replacement of warranted products or for any consequential damages. EASTROCK TECHNOLOGY, INC further reserves the right to refuse to honor the above warranty for any product(s) altered, improperly installed, or installed in applications for which not intended.

MADE IN U.S.A.

DISTRIBUTED BY

The Leading Edge in Lighting Technology

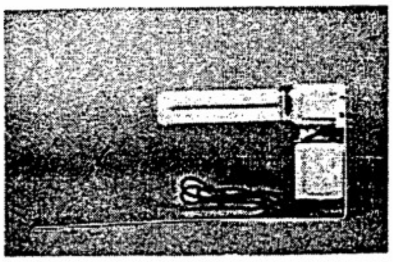
EASTROCK TECHNOLOGY, INC.
30-40 Northfield Ave., Raritan Center
P.O. Box 6231 • Edison, NJ 08818
Telephone (201) 225-5344 • Fax: (201) 225-8765

3-68

PRINTED IN U.S.A. 5/88

RETROFITS

EXIT SIGN RETROFITS



CAT#

R-100
R-101

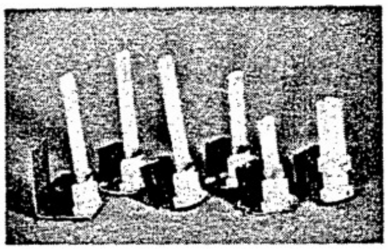
Reduces energy costs and provides extensive savings in labor and lamp replacement costs due to extremly long life of PL lamps.

PL bracket mounted prewired kit for ease of installation.

Equiped with PL-5, 2x5, 7, 2x7 or 9 watt lamps; 120 volts.

Height 4", Width 9 1/2", Depth 1 1/8"

HARD WIRED DISC OR L BRACKET



CAT#

R-200
R-201
R202

Replaces short lived incandescent bulbs in existing fixtures..

Suitable for retrofitting recessed canopy lighting, pagodas, wall or ceiling fixtures.

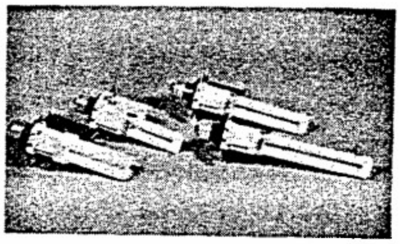
Equipped with PL-5, 7, 9, 9D, 13 or 13D watt lamps.

CAT#

R-300
R-301
R302

DISC	L BRACKET
2 3/4" dia.	Depth 2 1/2" , Width 2 1/4".

SCREW-IN ADAPTERS



CAT#

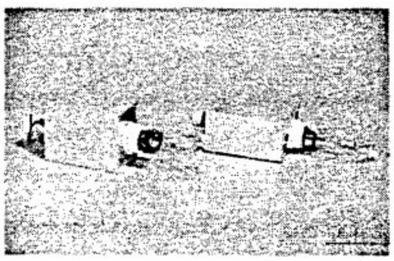
R-400
R-401
R-402

Medium edison base screws into existing socket. Replaces short lived incandescent bulbs in existing fixtures. Many applications.

Equipped with PL-5, 7, 9, 9D or 13D watt lamps.

Disc 2 3/4" DIA.

HIGH PRESSURE SODIUM CANNISTER SCREW-IN



CAT#

R-500
R-501

Energy saving conversion unit containing ignitor and 120V HPS ballast in aluminum cannistar with top mounted medium base socket for HPS lamp.

Available with medium edison base or 3/8" nipple.

Equipped with HPS 35, 50 or 70 watt lamp.

Cannister 4 1/2" x 3 1/2" x 2 1/2"

Overall dimension including lamp 9 1/2"

BEL *Belgrade Efficient Lighting*
4424 W. Pico Boulevard, Los Angeles, CA 90019 *(213) 933-5233*
FAX 933-5249

Sunburst designs

FACSIMILE TRANSMISSION

THE FOLLOWING IS A FAX TRANSMISSION FROM:
SUNBURST DESIGNS, INC. 808-841-6296(FAX)

TO: Linda
C. CHONG

FROM: LINDA MORAN

DATE: 9-1-92

THERE ARE 2 PAGES IN THIS TRANSMISSION INCLUDING THIS COVER SHEET

SUBJECT: BEL SIZES
PL RETROFITS

MESSAGE:

Hi Linda,

Per our conversation, here are the height's of the various BEL retrofits that we represent.

If I can be of further assistance on this or any other lighting project, please feel free to call on my assistance.

Thanks

3-68 B

TO: SUNBURST DESIGNS
ATTN: LINDA MORAN
DATE: 8-28-92
RE: YOUR FAX FROM 8-27-92
SUBJECT: R-400,401,402 retro's

MESSAGE: Height 3½ from the bottom of base to the top of transformer
Width 2¼

PLEASE CONTACT US FOR MORE INFORMATION.
OUR NEW PHONE # IS: 310-672-9794
OUR NEW FAX # is: 310-672-9813

THANK YOU !

B.E.L. 1223 Wilshire Boulevard #574, Santa Monica, CA 90403 Tel (310)672-9794 Fax:(310)672-9813

68C
3-8

2135679343

DEC 21 '90 15:53 BEL 2135679343 TO: 808 841 6296 P01

RECEIVED DEC 2 1 1990

BEL efficient lighting 2531 E. 115TH PLACE, LOS ANGELES, CA 90059, TEL.(213)567-7240 FAX. (213)567-9343

12.21.90

Linda Nolan

Sunburst designs

Re your fax transmission of today
subject R-400, 401, 402
RETROS

R-400-7W lenght 5 1/4 from socket to tip of lamp
R-400-9W — " — 6 3/8 — " —
R-401-13W — " — 7 — " —
R-402-13WD — " — 5 1/4 — " —

Michael

HPF w/cap

68D
3-[illegible]

4. Non-Energy Related Considerations

A. Color Rendering

Color is not a physical property of an object, but rather it is the effect of light waves bouncing off the object. Thus, the color of objects is effected by the characteristics of the light source it is viewed under. It is preferable to utilize lighting systems which renders the natural color of an object, but this is a subjective judgement dependent on individual preferences. Generally speaking however, people seem to prefer incandescent light sources which tend to accent and complement warm colors (reds, oranges and yellows). Fluorescent lighting on the other hand, has a 'graying' effect on warm colors which some people may find distracting or disturbing. Though not quantifiable, the reactions of the housing residents to the use of fluorescent lights throughout the unit must be weighed against the energy savings potential of this option. It should be noted that fluorescent fixtures are already in use in the majority of the different unit types in many different locations (Bedroom, Living/Dining Room, Kitchen, Laundry).

B. Retrofit Problems

Fluorescent adapters are normally larger than than their incandescent bulb counterparts.

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DATE: JOB No.:
PROJECT NAME: BY:
SUBJECT:

However, ultra short double type adapters are available (~ 5½-6" long for a 75 W incandescent equivalent) that should be able to fit in the majority of the existing luminaires. There is no uniformity in the types of light fixtures used within and between each unit type. Therefore, because this study includes only a limited site survey of the units, we are unable to confirm that the fluorescent adapters will fit in all the different existing fixture types. However, we estimate that the adapters will be able to be used in 70% of the fixtures. We have adjusted the calculated annual energy savings to reflect this diversity factor. Since the construction costs also decrease proportionally, the overall payback and S.I.R for this ECO remains the same regardless of the actual number of lamps which are replaced.

This ECO should be easily implemented since the base already has a program for supplying lamps for fluorescent fixtures to residents through an on-base exchange center. The new fluorescent adapters can be stocked at the center and distributed along with the other types of lamps

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Telephone (808) 847-6557 Telefax: (808) 847-6550

DATE: JOB No.:
PROJECT NAME: BY:
SUBJECT: Sht. 3-68F Of

3.3 Energy Conserving Fluorescent Light & Ballast

1. Background:

Existing fluorescent fixtures that can be replaced with energy efficient lamps and electronic ballasts are only located in the kitchen & Laundry areas.

2. Assumptions:

a. New fluorescent fixtures will have electronic ballasts and energy saving lamps.

b. Lighting levels will be increased to comply w/ IES recommended levels where possible.

c. Exist. light fixtures have the following energy usage:

1) Single lamp, 4'-40W Fl. Fixture = 57 W
2) Two lamp, 4'-40W " " = 95 W
3) Four lamp, 4'-40W Fl. fixture = 190 W

d. New Light Fixtures will have following energy usage:

1) Single lamp, 4'-40W Fl. fixture = 35 W
2) Two lamp, 4'-40W " " = 69 W
3) Four lamp, 4'-40W " " = 109 W

3. Comparison of Energy Usage:

see following tables

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2130-E North King Street Honolulu, Hawaii 96819
Telephone (808) 847-6557 Telefax: (808) 847-6550

DATE: JOB No.:
PROJECT NAME: BY:
SUBJECT:

UNIT TYPE	LOCATION	EXIST. FIXT. (W)	QUAN.	ENERGY USED	AREA (SF)	NEW FIX (W)	QUAN	ENERGY USED (W)	ENERGY SAVED (W)
20-II	No Replaceable Fluorescent Fixtures								
20-III	No Replaceable Fluorescent Fixtures								
20-IV	Kitchen	40W 4-LAMP	1	190	76	40W 4-LAMP	1	109	81
20-V	Kitchen	40W 4-LAMP	1	190	30	40W 4-LAMP	1	109	81

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2130-E North King Street Honolulu, Hawaii 96819
Telephone (808) 847-6557 Telefax: (808) 847-6550

DATE:
JOB No.:
PROJECT NAME:
BY:
SUBJECT:
Sht. 01 3-70

UNIT TYPE	LOCATION	EXIST. FIXT. (W/LAMPS)	QUAN.	ENERGY USED	AREA (SF)	NEW FIX (W)	QUAN.	ENERGY USED (W)	ENERGY SAVED (W)
32-I	KITCHEN	40-4L	1	190	117	109	1	109	81
32-II									
	LAUNDRY	40-4L	1	190	81	109	1	109	81
	BATHROOM	40-4L	1	190	60	109	1	109	81

NOTE: Unit Type 32-II has the same interior floor plan as Unit Type 32-I

32-III	No Replaceable fluorescent fixtures								
32-IV	BATH 2	40-1L	1	57	56	35	1	35	22

EDRIC D. O. CHONG & ASSOCIATES, INC.
CONSULTING MECHANICAL & ELECTRICAL ENGINEERS
2130-E North King Street Honolulu, Hawaii 96819
Telephone (808) 847-6557 Telefax: (808) 847-6550

DATE:
JOB No.:
PROJECT NAME:
BY:
SUBJECT:

UNIT TYPE	LOCATION	EXIST. FIXT. (W)	QUAN.	ENERGY USED	AREA (SF)	NEW FIX (W)	QUAN.	ENERGY USED (W)	ENERGY SAVED (W)
57-I	No Replaceable Fluorescent Lights								
57-II	No Replaceable Fluorescent Lights								
57-III	KIT.	40W 2LAMP	1	95	35	40W 2LAMP	1	69	26
	BATH	40W 1LAMP	1	57	21	40W 1LAMP	1	35	22
57-IV	No Replaceable Fluorescent Lights								
57-V	KITCHEN	40W 2LAMP	1	95	35	40W 2LAMP	1	69	26
		40W 1LAMP	1	57	35	40W 1LAMP	1	35	22
	NOTE: UNIT TYPE 57-VII has the same interior floor plan as Unit Type 57-V								
57-VI	No Replaceable Fluorescent Lights								
57-VIII	No Replaceable Fluorescent Lights								
57-IX	No Replaceable Fluorescent Lights								

DRIC D. O. CHONG & ASSOCIATES, INC.
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130-E North King Street Honolulu, Hawaii 96819
Telephone (808) 847-6557 Telefax: (808) 847-6560

DATE: JOB No.:

PROJECT NAME: BY:

SUBJECT: Sht. Of 3-72

UNIT TYPE	LOCATION	EXIST. FIXT. (W)	QUAN.	ENERGY USED	AREA (SF)	NEW FIX (W)	QUAN.	ENERGY USED (W)	ENERGY SAVED (W)
60-I	KITCHEN	40W 2-LAMP	2	190	28	40W 2-LAMP	2	138	52
60-II	KITCHEN	40W 2 LAMPS	1	95	35	40W 2-LAMP	1	69	26
	BATH	40W 1 LAMP	1	57	15	40W 1-LAMP	1	35	22
60-III	KITCHEN	40W 2 LAMP	1	95	35	40W 2-LAMP	1	69	26
71-I	No Replaceable fluorescent fixtures								

[redacted]DRIC D. O. CHONG & ASSOCIATES, INC.
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DATE: JOB No.:

PROJECT NAME: BY:

SUBJECT: Sht. Of 3-73

4. Summary of Savings (per unit):

UNIT TYPE	LOCATION	LIGHTING SAVINGS (W)	HRS PER DAY IN OPERATION	DAILY SAVINGS (KWH)
20-IV	KITCHEN	81	4	0.324

ANNUAL ENERGY SAVINGS (per unit)

$= 0.324\ \text{KWH/Day} \times 365\ \text{day/yr} = 118\ \text{KWH/yR}$

ANNUAL COST SAVINGS (per unit)

$= 118\ \text{KWH/yR} \times (\$0.068/\text{KWH}) = \$8.02$

Cost of New Energy Saving Fixture = \$ 600
(see attached)

$\text{Payback} = \dfrac{\$\ 600}{\$\ 8.02\ /\text{yR}} = 74.8\ \text{yrs}$

SIR = 0.16 (see attached)

EDRIC D. O. CHONG & ASSOCIATES, INC.
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Telephone (808) 847-6557 Telefax: (808) 847-6550

DATE: JOB No.:
PROJECT NAME: BY:
SUBJECT:

LABOR RATE : $21.01 + 15% LB - 30   SAY 38.20

PROJEC[T]: INSTALL NEW FLUOR. FIXTURES | ESTIMATOR | CHECKED BY | SHEET OF

TASK DESCRIPTION	QUANTITY		LABOR				EQUIPMENT		MATERIAL		TOTAL
	NO. OF UNITS	UNIT MEAS	MH/UNIT	TOTAL HRS	UNIT PRICE	COST	UNIT PRICE	COST	UNIT PRICE	COST	
Unit Type 20-IV.											
Remove Exist fixture	1	EA	0.5	0.5	38.20	19.10					19.10
NEW SINGLE LAMP, SURFACE FIXTURE	0	EA.	1.0						151		0
NEW 2 LAMP, SURFACE FIX.	0	EA	1.10						186		0
NEW 4 LAMP, SURFACE FIX.	1	EA	1.50	1.50		57.30			367	367	424.30
								SUBTOTAL			443.40
								CITY COST		(10%)	44.34
								PROFIT		(10%)	44.34
NOTE:								O/H		(15%)	66.51
a) Prices for fixture includes cost for electronic ballast & energy saving lamps											
								TOTAL			598.59
b) Prices from MEAN'S ELECTRICAL COST DATA & ELECTRICAL TRADE BOOK COST DATA										SAY	$1600

DA FORM 5418-R, Apr 85 CONTD

LIFE CYCLE COST ANALYSIS SUMMARY
ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP)

LOCATION: ______ REGION NO. ____ PROJECT NUMBER ______

PROJECT TITLE INSTALL NEW Fluor. FIX. FISCAL YEAR ______

DISCRETE PORTION NAME UNIT TYPE 20 - IV

ANALYSIS DATE ______ ECONOMIC LIFE 25 YEARS PREPARED BY ____

1. INVESTMENT COSTS
   A. CONSTRUCTION COST $ 600.00
   B. SIOH (5.5%) $ 33.00
   C. DESIGN COST (10%) $ 60.00
   D. ENERGY CREDIT CALC (1A+1B+1C)X.9 $ 623.70
   E. SALVAGE VALUE OF EXISTING EQUIPMENT $ ______
   F. TOTAL INVESTMENT (1D-1E) $ 623.70

2. ENERGY SAVINGS (+) / COST (-)
   ANALYSIS DATE ANNUAL SAVINGS, UNIT COST $ DISCOUNTED SAVINGS

FUEL	COST $/MBTU(1)	SAVINGS MBTU/YR(2)	ANNUAL $ SAVINGS(3)	DISCOUNT FACTOR(4)	DISCOUNTED SAVINGS(5)
A. ELEC	$ 19.90	0.403/unit	$ 8.02	12.12	$ 97.20
B. DIST	$		$		$
C. RESID	$		$		$
D. NG	$		$		$
E. COAL	$		$		$
F. TOTAL			$ 8.02		$ 97.20

3. NON ENERGY SAVINGS (+) / COST (-)
   A. ANNUAL RECURRING (+/-) $ 0
      (1) DISCOUNT FACTOR (TABLE 1) ______
      (2) DISCOUNTED SAVING/COST (3A X 3A1) $ 0

   B. NON RECURRING SAVINGS (+) / COST (-)

ITEM	SAVINGS $ (+) COST $ (-)(1)	YEAR OF OCCURRENCE(2)	DISCOUNT FACTOR (3)	DISCOUNTED SAVINGS (+) COST(-)(4)
a.	$			$
b.	$			$
c.	$			$
d. TOTAL	$			$

   C. TOTAL NON ENERGY DISCOUNTED SAVINGS (+) / COST (-) (3A2+3Bd4) $ ______

   D. PROJECT NON ENERGY QUALIFICATION TEST
   (1) 25% MAX NON ENERGY CALC (2F5 X .33) $ 32.08
      a. IF 3D1 IS = OR 3C GO TO ITEM 4
      b. IF 3D1 IS 3C CALC SIR = (2F5+3D1) : 1F = ______
      c. IF 3D1b IS = 1 GO TO ITEM 4
      d. IF 3D1b IS 1 PROJECT DOES NOT QUALIFY

4. FIRST YEAR DOLLAR SAVINGS 2F3+3A+(3B1d : YEARS ECONOMIC LIFE) $ 8.02

5. TOTAL NET DISCOUNTED SAVINGS (2F5+3C) $ ______

6. SIR (IF 1 PROJECT DOES NOT QUALIFY) (SIR)=(5 : 1F)= 0.16

UNIT TYPE	LOCATION	LIGHTING SAVINGS (W)	HRS PER DAY IN OPERATION	DAILY SAVINGS (KWH)
20-V	KITCHEN	81	4	0.324

ANNUAL ENERGY SAVINGS (per unit)
= 0.324 KWH/Day × 365 day/yr = 118 KWH/yr

ANNUAL COST SAVINGS (per unit)
= 118 KWH/yr × (0.068 / KWH) = $8.02

Cost for New Energy Saving Fixtures = $ 600
(see attached)

Payback = $ 600 / $ 8.02 /yr = 74.8 yrs

SIR = 0.16 (see attached)

EDRIC D. O. CHONG & ASSOCIATES, INC.
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DATE: JOB No.:
PROJECT NAME: BY:
SUBJECT: Sht. 01 3-77

LABOR RATE: $21.01 + 75% LD = 36.76 SAY 38.20

PROJE INSTALL NEW FLUOR. FIXTURES | ESTIMATOR | CHECKED BY | SHEET OF ...TS

TASK DESCRIPTION	QUANTITY		LABOR				EQUIPMENT		MATERIAL		TOTAL
	NO. OF UNITS	UNIT MEAS	MH/UNIT	TOTAL HRS	UNIT PRICE	COST	UNIT PRICE	COST	UNIT PRICE	COST	
Unit Type 20-V											
Remove Exist Fixture	1	EA	0.5	0.5	38.20	19.10					19.10
NEW SINGLE LAMP,	0	EA.	1.0			0			151		0
SURFACE FIXTURE											
NEW 2 LAMP, SURFACE FIX.	0	EA	1.10			0			186		0
NEW 4 LAMP, SURFACE FIX.	1	EA	1.50	1.50		57.30			367	367	424.30
							SUBTOTAL				443.40
							CITY COST			(10%)	44.34
NOTE:							PROFIT			(10%)	44.34
a) Prices for fixture includes cost for							O/H		(15%)		66.51
electronic ballast & energy saving lamps											
							TOTAL				598.59
b) Prices from Mean's Electrical Cost Data											
& Electrical Trade Book Cost Data										SAY	$600

DA FORM 5419-R, Apr 85 CONTD

LIFE CYCLE COST ANALYSIS SUMMARY
ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP)

LOCATION: ______ REGION NO. ____ PROJECT NUMBER ______

PROJECT TITLE INSTALL NEW Fluor. FIX. FISCAL YEAR ______

DISCRETE PORTION NAME UNIT TYPE 20-V

ANALYSIS DATE ______ ECONOMIC LIFE 25 YEARS PREPARED BY ____

1. INVESTMENT COSTS
   A. CONSTRUCTION COST $ 600.00
   B. SIOH (5.5%) $ 33.00
   C. DESIGN COST (10%) $ 60.00
   D. ENERGY CREDIT CALC (1A+1B+1C)X.9 $ 623.70
   E. SALVAGE VALUE OF EXISTING EQUIPMENT $ ______
   F. TOTAL INVESTMENT (1D-1E) $ 623.70

2. ENERGY SAVINGS (+) / COST (-)
   ANALYSIS DATE ANNUAL SAVINGS, UNIT COST $ DISCOUNTED SAVINGS

FUEL	COST $/MBTU(1)	SAVINGS MBTU/YR(2)	ANNUAL $ SAVINGS(3)	DISCOUNT FACTOR(4)	DISCOUNTED SAVINGS(5)
A. ELEC	$ 19.90	0.403/unit	$ 8.02	12.12	$ 97.20
B. DIST	$		$		$
C. RESID	$		$		$
D. NG	$		$		$
E. COAL	$		$		$
F. TOTAL			$ 8.02		$ 97.20

3. NON ENERGY SAVINGS (+) / COST (-)
   A. ANNUAL RECURRING (+/-) $ 0
      (1) DISCOUNT FACTOR (TABLE 1) ______
      (2) DISCOUNTED SAVING/COST (3A X 3A1) $ 0

   B. NON RECURRING SAVINGS (+) / COST (-)

ITEM	SAVINGS $ (+) COST $ (-)(1)	YEAR OF OCCURRENCE(2)	DISCOUNT FACTOR (3)	DISCOUNTED SAVINGS (+) COST(-)(4)
a.	$			$
b.	$			$
c.	$			$
d. TOTAL	$			$

   C. TOTAL NON ENERGY DISCOUNTED SAVINGS (+) / COST (-) (3A2+3Bd4) $ ______

   D. PROJECT NON ENERGY QUALIFICATION TEST
   (1) 25% MAX NON ENERGY CALC (2F5 X .33) $ 32.08
      a. IF 3D1 IS = OR 3C GO TO ITEM 4
      b. IF 3D1 IS 3C CALC SIR = (2F5+3D1) : 1F = ______
      c. IF 3D1b IS = 1 GO TO ITEM 4
      d. IF 3D1b IS 1 PROJECT DOES NOT QUALIFY

4. FIRST YEAR DOLLAR SAVINGS 2F3+3A+(3B1d : YEARS ECONOMIC LIFE) $ 8.02

5. TOTAL NET DISCOUNTED SAVINGS (2F5+3C) $ 97.20

6. SIR (IF 1 PROJECT DOES NOT QUALIFY) (SIR)=(5 : 1F)= 0.16

UNIT TYPE	LOCATION	LIGHTING SAVINGS (W)	HRS PER DAY IN OPERATION	DAILY SAVINGS (KWH)
32-I & 32-II	KITCHEN	81	4	0.324
	LAUNDRY	81	2	0.162
	BATHROOM	81	4	0.324
TOTAL			=	0.810

ANNUAL ENERGY SAVINGS (per unit)

= 0.810 KWH/Day × 365 Day/yR = 296 KWH/yr

ANNUAL COST SAVINGS (per unit)

= 296 KWH/yr × ($ 0.068 / KWH) = $ 20.13

Cost of new energy saving fluorescent fixtures = $1,800
(see attached)

$$\text{Payback} = \frac{\$\ 1{,}800}{\$\ 20.13\ /\text{yr}} = 89.4\ \text{yrs}$$

SIR = 0.13 (see attached)

EDRIC D. O. CHONG & ASSOCIATES, INC.
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DATE: JOB No.:

PROJECT NAME: BY:

SUBJECT: Sht. of 3-80

LABOR RATE: $21.81 + 75% LB = 38.[illegible] SAY 38.20

PROJECT: INSTALL NEW FLUOR. FIXTURES | ESTIMATOR | CHECKED BY | SHEET OF

TASK DESCRIPTION	QUANTITY: NO. OF UNITS	QUANTITY: UNIT MEAS	LABOR: MH/UNIT	LABOR: TOTAL HRS	LABOR: UNIT PRICE	LABOR: COST	EQUIPMENT: UNIT PRICE	EQUIPMENT: COST	MATERIAL: UNIT PRICE	MATERIAL: COST	TOTAL
Unit Type 32-I, 32-II											
Remove Exst fixture	3	EA	0.5	1.5	38.20	57.30					57.30
NEW SINGLE LAMP, SURFACE FIXTURE	0	EA.	1.0			0			151		0
NEW 2 LAMP, SURFACE FIX.	0	EA	1.10			0			186		0
NEW 4 LAMP, SURFACE FIX.	3	EA	1.50	4.5		171.90			367	1,101	1,272.90
								Subtotal			1,330.20
								City	Costs (10%)		133.02
NOTE:								Profit	(10%)		133.02
a) Price for fixture includes cost for electronic ballast & energy saving lamps								O/H	(15%)		199.53
								Total			1795.77
										SAY	$1800

DA FORM 5418-R, Apr 85 CONTD

LIFE CYCLE COST ANALYSIS SUMMARY
ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP)

LOCATION:________ REGION NO.____ PROJECT NUMBER________

PROJECT TITLE *INSTALL NEW Fluor. FIX.* FISCAL YEAR________

DISCRETE PORTION NAME *UNIT TYPE 32-I, 32-II*

ANALYSIS DATE ________ ECONOMIC LIFE *25* YEARS PREPARED BY ____

1. INVESTMENT COSTS

A.	CONSTRUCTION COST	$ *1800.00*
B.	SIOH (*5.5%*)	$ *99.00*
C.	DESIGN COST (*10%*)	$ *180.00*
D.	ENERGY CREDIT CALC (1A+1B+1C)X.9	$ *1871.10*
E.	SALVAGE VALUE OF EXISTING EQUIPMENT	$
F.	TOTAL INVESTMENT (1D-1E)	$ *1,871.10*

2. ENERGY SAVINGS (+) / COST (-)
ANALYSIS DATE ANNUAL SAVINGS, UNIT COST $ DISCOUNTED SAVINGS

FUEL	COST $/MBTU(1)	SAVINGS MBTU/YR(2)	ANNUAL $ SAVINGS(3)	DISCOUNT FACTOR(4)	DISCOUNTED SAVINGS(5)
A. ELEC	$ *19.93*	*1.010 /unit*	$ *20.13*	*12.12*	$ *243.98*
B. DIST	$		$		$
C. RESID	$		$		$
D. NG	$		$		$
E. COAL	$		$		$
F. TOTAL			$ *20.13*		$ *243.98*

3. NON ENERGY SAVINGS (+) / COST (-)
   A. ANNUAL RECURRING (+/-) $ *0*
      (1) DISCOUNT FACTOR (TABLE 1) ____
      (2) DISCOUNTED SAVING/COST (3A X 3A1) $ *0*

   B. NON RECURRING SAVINGS (+) / COST (-)

ITEM	SAVINGS $ (+) COST $ (-)(1)	YEAR OF OCCURRENCE(2)	DISCOUNT FACTOR (3)	DISCOUNTED SAVINGS (+) COST(-)(4)
a.____	$			$
b.____	$			$
c.____	$			$
d. TOTAL	$			$

   C. TOTAL NON ENERGY DISCOUNTED SAVINGS (+) / COST (-) (3A2+3Bd4) $____

   D. PROJECT NON ENERGY QUALIFICATION TEST
   (1) 25% MAX NON ENERGY CALC (2F5 X .33) $ *80.51*
      a. IF 3D1 IS = OR 3C GO TO ITEM 4
      b. IF 3D1 IS 3C CALC SIR = (2F5+3D1) : 1F = ____
      c. IF 3D1b IS = 1 GO TO ITEM 4
      d. IF 3D1b IS 1 PROJECT DOES NOT QUALIFY

4. FIRST YEAR DOLLAR SAVINGS 2F3+3A+(3B1d : YEARS ECONOMIC LIFE) $ *20.13*

5. TOTAL NET DISCOUNTED SAVINGS (2F5+3C) $ *243.98*

6. SIR (IF 1 PROJECT DOES NOT QUALIFY) (SIR)=(5 : 1F)= *0.13*

UNIT TYPE	LOCATION	LIGHTING SAVINGS (W)	HRS PER DAY IN OPERATION	DAILY SAVINGS (KWH)
32-IV	Bath 2	22	4	0.088

ANNUAL ENERGY SAVINGS (per unit)
= 0.088 KWH/day x 365 Day/yr = 32 KWH/yr

ANNUAL COST SAVINGS (per unit)
= 32 KWH/yr x ($0.068 /KWH) = $2.18

Cost of new energy saving fluor. fixtures = $280
(see attached)

Payback = $280 / $2.18 /yr = 128.4 yrs

SIR = 0.09 (see attached)

EDRIC D. O. CHONG & ASSOCIATES, INC.
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DATE: JOB No.:
PROJECT NAME: BY:
SUBJECT: Sht. Of 3-83

LABOR RATE : $21.01 + 15% LB = 38.16 SAY 38.20

PROJECT: INSTALL NEW FLUOR. FIXTURES | ESTIMATOR | CHECKED BY | SHEET OF

TASK DESCRIPTION	QUANTITY		LABOR				EQUIPMENT		MATERIAL		TOTAL
	NO. OF UNITS	UNIT MEAS	MH/UNIT	TOTAL HRS	UNIT PRICE	COST	UNIT PRICE	COST	UNIT PRICE	COST	
Unit Type 32-IV											
Remove Exist fixture	1	EA	0.5	0.5	38.20	19.10					19.10
NEW SINGLE LAMP, SURFACE FIXTURE	1	EA.	1.0	1.0		38.20			151	151	189.20
NEW 2 LAMP, SURFACE FIX.	0	EA	1.10			0			186	0	0
NEW 4 LAMP, SURFACE FIX.	0	EA	1.50			0			367	0	0
							SUBTOTAL				208.30
							City Cost (10%)				20.83
NOTE :							Profit (10%)				20.83
1) Prices for fixture includes cost for electronic ballast & energy saving lamps							O/H (15%)				31.25
							TOTAL				281.21
										SAY	$280

DA FORM 5418-R, Apr 85 CONTD

LIFE CYCLE COST ANALYSIS SUMMARY
ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP)

LOCATION: ______ REGION NO. ____ PROJECT NUMBER ______

PROJECT TITLE INSTALL NEW Fluor. FIX. FISCAL YEAR ______

DISCRETE PORTION NAME UNIT TYPE 32-IV

ANALYSIS DATE ______ ECONOMIC LIFE 25 YEARS PREPARED BY ____

1. INVESTMENT COSTS
   A. CONSTRUCTION COST $ 280.00
   B. SIOH (5.5%) $ 15.40
   C. DESIGN COST (10%) $ 28.00
   D. ENERGY CREDIT CALC (1A+1B+1C)X.9 $ 291.06
   E. SALVAGE VALUE OF EXISTING EQUIPMENT $ ______
   F. TOTAL INVESTMENT (1D-1E) $ 291.06

2. ENERGY SAVINGS (+) / COST (-)
   ANALYSIS DATE ANNUAL SAVINGS, UNIT COST $ DISCOUNTED SAVINGS

FUEL	COST $/MBTU(1)	SAVINGS MBTU/YR(2)	ANNUAL $ SAVINGS(3)	DISCOUNT FACTOR(4)	DISCOUNTED SAVINGS(5)
A. ELEC	$20.00	0.109/unit	$ 2.18	12.12	$26.42
B. DIST	$		$		$
C. RESID	$		$		$
D. NG	$		$		$
E. COAL	$		$		$
F. TOTAL			$ 2.18		$ 26.42

3. NON ENERGY SAVINGS (+) / COST (-)
   A. ANNUAL RECURRING (+/-) $ 0
      (1) DISCOUNT FACTOR (TABLE 1) ______
      (2) DISCOUNTED SAVING/COST (3A X 3A1) $ 0

   B. NON RECURRING SAVINGS (+) / COST (-)

ITEM	SAVINGS $ (+) COST $ (-)(1)	YEAR OF OCCURRENCE(2)	DISCOUNT FACTOR (3)	DISCOUNTED SAVINGS (+) COST(-)(4)
a. ______	$			$
b. ______	$			$
c. ______	$			$
d. TOTAL	$			$

   C. TOTAL NON ENERGY DISCOUNTED SAVINGS (+) / COST (-) (3A2+3Bd4) $ ______

   D. PROJECT NON ENERGY QUALIFICATION TEST
   (1) 25% MAX NON ENERGY CALC (2F5 X .33) $ 8.72
      a. IF 3D1 IS = OR 3C GO TO ITEM 4
      b. IF 3D1 IS 3C CALC SIR = (2F5+3D1) : 1F = ______
      c. IF 3D1b IS = 1 GO TO ITEM 4
      d. IF 3D1b IS 1 PROJECT DOES NOT QUALIFY

4. FIRST YEAR DOLLAR SAVINGS 2F3+3A+(3B1d : YEARS ECONOMIC LIFE) $ 2.18

5. TOTAL NET DISCOUNTED SAVINGS (2F5+3C) $ 26.42

6. SIR (IF 1 PROJECT DOES NOT QUALIFY) (SIR)=(5 : 1F)= 0.09

UNIT TYPE	LOCATION	LIGHTING SAVINGS (W)	HRS PER DAY IN OPERATION	DAILY SAVINGS (KWH)
57-III	KITCHEN	26	4	0.104
	BATH	22	4	0.088
TOTAL			=	0.192

ANNUAL ENERGY SAVINGS

$= 0.192 \text{ KWH/Day} \times 365 \text{ Day/yr} = 70 \text{ KWH/yr}$

ANNUAL COST SAVINGS

$= 70 \text{ KWH/yr} \times (\$0.068 \text{ /KWH}) = \$4.76$

Cost for new energy savings fluor. fixtures = \$ 610 (see attached)

$\text{Payback} = \dfrac{\$\ 610}{\$\ 4.76\ /\text{yr}} = 128.2 \text{ yrs}$

SIR = 0.09 (see attached)

CEDRIC D. O. CHONG & ASSOCIATES, INC.
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...0-E North King Street Honolulu, Hawaii 96819
Telephone (808) 847-6557 Telefax: (808) 847-6550

DATE: JOB No.:
PROJECT NAME: BY:
SUBJECT: Sht. Of 3-86

LABOR RATE · $21.01 + 15% LB - 3[illegible] SAY 38.20

PROJECT: INSTALL NEW FLUOR. FIXTURES							ESTIMATOR	CHECKED BY	SHEET OF		SHEETS
	QUANTITY		LABOR				EQUIPMENT		MATERIAL		
TASK DESCRIPTION	NO OF UNITS	UNIT MEAS	MH/UNIT	TOTAL HRS	UNIT PRICE	COST	UNIT PRICE	COST	UNIT PRICE	COST	TOTAL
Unit Type 57-III											
Remove Exst fixture	2	EA	0.5	1.0	38.20	38.20					38.20
NEW SINGLE LAMP, SURFACE FIXTURE	1	EA.	1.0	1.0		38.20			151	151	189.20
NEW 2 LAMP, SURFACE FIX.	1	EA	1.10	1.10		42.02			186	186	228.02
NEW 4 LAMP, SURFACE FIX.	0	EA	1.50	0		0			367	0	0
								SUBTOTAL			455.42
								City	Cost	(10%)	45.54
NOTE:								Profit	(10%)		45.54
a) Prices for fixture includes cost for electronic ballast & energy saving lamps								O/H	(15%)		68.31
								TOTAL			614.81
										SAY	$610

DA FORM 5419-R, Apr 85 CONTD

LIFE CYCLE COST ANALYSIS SUMMARY
ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP)

LOCATION:________ REGION NO.____ PROJECT NUMBER________

PROJECT TITLE INSTALL NEW Fluor. FIX. FISCAL YEAR________

DISCRETE PORTION NAME Unit Type 57-III

ANALYSIS DATE ________ ECONOMIC LIFE 25 YEARS PREPARED BY ____

1. INVESTMENT COSTS
   A. CONSTRUCTION COST $ 610.00
   B. SIOH (5.5%) $ 33.35
   C. DESIGN COST (10%) $ 61.00
   D. ENERGY CREDIT CALC (1A+1B+1C)X.9 $ 634.10
   E. SALVAGE VALUE OF EXISTING EQUIPMENT $ ____
   F. TOTAL INVESTMENT (1D-1E) $ 634.10

2. ENERGY SAVINGS (+) / COST (-)
   ANALYSIS DATE ANNUAL SAVINGS, UNIT COST $ DISCOUNTED SAVINGS

FUEL	COST $/MBTU(1)	SAVINGS MBTU/YR(2)	ANNUAL $ SAVINGS(3)	DISCOUNT FACTOR(4)	DISCOUNTED SAVINGS(5)
A. ELEC	$ 19.92	0.239/unit	$ 4.76	12.12	$ 57.69
B. DIST	$		$		$
C. RESID	$		$		$
D. NG	$		$		$
E. COAL	$		$		$
F. TOTAL			$ 4.76		$ 57.69

3. NON ENERGY SAVINGS (+) / COST (-)
   A. ANNUAL RECURRING (+/-) $ 0
      (1) DISCOUNT FACTOR (TABLE 1) ____
      (2) DISCOUNTED SAVING/COST (3A X 3A1) $ 0

   B. NON RECURRING SAVINGS (+) / COST (-)

ITEM	SAVINGS $ (+) COST $ (-)(1)	YEAR OF OCCURRENCE(2)	DISCOUNT FACTOR (3)	DISCOUNTED SAVINGS (+) COST(-)(4)
a.	$			$
b.	$			$
c.	$			$
d. TOTAL	$			$

   C. TOTAL NON ENERGY DISCOUNTED SAVINGS (+) / COST (-) (3A2+3Bd4) $____

   D. PROJECT NON ENERGY QUALIFICATION TEST
   (1) 25% MAX NON ENERGY CALC (2F5 X .33) $ 19.04
      a. IF 3D1 IS = OR 3C GO TO ITEM 4
      b. IF 3D1 IS 3C CALC SIR = (2F5+3D1) : 1F = ____
      c. IF 3D1b IS = 1 GO TO ITEM 4
      d. IF 3D1b IS 1 PROJECT DOES NOT QUALIFY

4. FIRST YEAR DOLLAR SAVINGS 2F3+3A+(3B1d : YEARS ECONOMIC LIFE) $ 4.76

5. TOTAL NET DISCOUNTED SAVINGS (2F5+3C) $ 57.69

6. SIR (IF 1 PROJECT DOES NOT QUALIFY) (SIR)=(5 : 1F)= 0.09

UNIT TYPE	LOCATION	LIGHTING SAVINGS (W)	HRS PER DAY IN OPERATION	DAILY SAVINGS (KWH)
57-V & 57-VII	KITCHEN	48	4	0.192

ANNUAL ENERGY SAVINGS

$$= 0.192 \text{ KWH/day} \times 365 \text{ days/yr} = 70 \text{ KWH/yr}$$

ANNUAL COST SAVINGS

$$= 70 \text{ KWH/yr} \times (\$0.068/\text{KWH}) = \$4.76$$

Cost of new energy savings fluor. fixtures = $ 610
(see attached)

$$\text{Payback} = \frac{\$ 610}{\$ 4.76 \text{ /yr}} = 128.2 \text{ yrs}$$

SIR = 0.09 (see attached)

CEDRIC D. O. CHONG & ASSOCIATES, INC.
CONSULTING MECHANICAL & ELECTRICAL ENGINEERS
-0-E North King Street Honolulu, Hawaii 96819
Telephone (808) 847-6557 Telefax: (808) 847-6550

DATE:	JOB No.:
PROJECT NAME:	BY:
SUBJECT:	Sht. Of 3-89

LABOR RATE: $21.81 + 15% LB = 38.[illegible] SAY 38.20

PROJECT: INSTALL NEW FLUOR. FIXTURES | ESTIMATOR | CHECKED BY | SHEET OF | [illegible]TS

TASK DESCRIPTION	QUANTITY: NO. OF UNITS	QUANTITY: UNIT MEAS	LABOR: MH/UNIT	LABOR: TOTAL HRS	LABOR: UNIT PRICE	LABOR: COST	EQUIPMENT: UNIT PRICE	EQUIPMENT: COST	MATERIAL: UNIT PRICE	MATERIAL: COST	TOTAL
Unit Type 57-V, 57-VII											
Remove Exist Fixture	2	EA	0.5	1.0	38.20	38.20					38.20
NEW SINGLE LAMP, SURFACE FIXTURE	1	EA.	1.0	1.0		38.20			151	151	189.20
NEW 2 LAMP, SURFACE FIX.	1	EA	1.10	1.10		42.02			186	186	228.02
NEW 4 LAMP, SURFACE FIX.	0	EA	1.50			0			367	0	0
								SUBTOTAL			455.42
								CITY COST (10%)			45.54
NOTE:								PROFIT (10%)			45.54
a) Prices for fixture includes cost for electronic ballast & energy saving lamps								O/H (15%)			68.31
								TOTAL			614.81
										SAY	$610

3-90

LIFE CYCLE COST ANALYSIS SUMMARY
ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP)

LOCATION: ______ REGION NO. ____ PROJECT NUMBER ______

PROJECT TITLE INSTALL NEW Fluor. FIX. FISCAL YEAR ______

DISCRETE PORTION NAME Unit Type 57-V, 57-VII

ANALYSIS DATE ______ ECONOMIC LIFE 25 YEARS PREPARED BY ____

1. INVESTMENT COSTS
   A. CONSTRUCTION COST $ 610.00
   B. SIOH (5.5%) $ 33.55
   C. DESIGN COST (10%) $ 61.00
   D. ENERGY CREDIT CALC (1A+1B+1C)X.9 $ 634.10
   E. SALVAGE VALUE OF EXISTING EQUIPMENT $ ______
   F. TOTAL INVESTMENT (1D-1E) $ 634.10

2. ENERGY SAVINGS (+) / COST (-)
   ANALYSIS DATE ANNUAL SAVINGS, UNIT COST $ DISCOUNTED SAVINGS

FUEL	COST $/MBTU(1)	SAVINGS MBTU/YR(2)	ANNUAL $ SAVINGS(3)	DISCOUNT FACTOR(4)	DISCOUNTED SAVINGS(5)
A. ELEC	$ 19.92	0.239/unit	$ 4.76	12.12	$ 57.69
B. DIST	$		$		$
C. RESID	$		$		$
D. NG	$		$		$
E. COAL	$		$		$
F. TOTAL			$ 4.76		$ 57.69

3. NON ENERGY SAVINGS (+) / COST (-)
   A. ANNUAL RECURRING (+/-) $ 0
      (1) DISCOUNT FACTOR (TABLE 1) ______
      (2) DISCOUNTED SAVING/COST (3A X 3A1) $ 0

   B. NON RECURRING SAVINGS (+) / COST (-)

ITEM	SAVINGS $ (+) COST $ (-)(1)	YEAR OF OCCURRENCE(2)	DISCOUNT FACTOR (3)	DISCOUNTED SAVINGS (+) COST(-)(4)
a.	$			$
b.	$			$
c.	$			$
d. TOTAL	$			$

   C. TOTAL NON ENERGY DISCOUNTED SAVINGS (+) / COST (-) (3A2+3Bd4) $ ____

   D. PROJECT NON ENERGY QUALIFICATION TEST
   (1) 25% MAX NON ENERGY CALC (2F5 X .33) $ 19.04
      a. IF 3D1 IS = OR 3C GO TO ITEM 4
      b. IF 3D1 IS 3C CALC SIR = (2F5+3D1) : 1F = ______
      c. IF 3D1b IS = 1 GO TO ITEM 4
      d. IF 3D1b IS 1 PROJECT DOES NOT QUALIFY

4. FIRST YEAR DOLLAR SAVINGS 2F3+3A+(3B1d : YEARS ECONOMIC LIFE) $ 4.76

5. TOTAL NET DISCOUNTED SAVINGS (2F5+3C) $ 57.69

6. SIR (IF 1 PROJECT DOES NOT QUALIFY) (SIR)=(5 : 1F)= 0.09

UNIT TYPE	LOCATION	LIGHTING SAVINGS (W)	HRS PER DAY IN OPERATION	DAILY SAVINGS (KWH)
60-I	KITCHEN	52	4	0.208

ANNUAL ENERGY SAVINGS

$$= 0.208 \ \text{KWH/day} \times 365 \ \text{day/yr} = 76 \ \text{KWH/yr}$$

ANNUAL COST SAVINGS

$$= 76 \ \text{KWH/yr} \times (\$0.068 \ /\text{KWH}) = \$5.17$$

Cost of new energy savings fluor. fixtures = $670

$$\text{Payback} = \frac{\$670}{\$5.17 \ /\text{yr}} = 130 \ \text{yrs}$$

SIR = 0.09 (see attached)

EDRIC D. O. CHONG & ASSOCIATES, INC.
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2130-E North King Street Honolulu, Hawaii 96819
Telephone (808) 847-6557 Telefax: (808) 847-6550

DATE: JOB No.:

PROJECT NAME: BY:

SUBJECT:

LABOR RATE : $21.81 + 75% LB = 38. SAY 38.20

PROJECT: INSTALL NEW FLUOR. FIXTURES | ESTIMATOR | CHECKED BY | SHEET OF

TASK DESCRIPTION	QUANTITY		LABOR				EQUIPMENT		MATERIAL		TOTAL
	NO. OF UNITS	UNIT MEAS	MH/UNIT	TOTAL HRS	UNIT PRICE	COST	UNIT PRICE	COST	UNIT PRICE	COST	
Unit Type 60-I											
Remove Exist Fixture	2	EA	0.5	1.0	38.20	38.20					38.20
NEW SINGLE LAMP, SURFACE FIXTURE	0	EA.	1.0	0		0			151	0	0
NEW 2 LAMP, SURFACE FIX.	2	EA	1.10	2.20		84.04			186	372	456.04
NEW 4 LAMP, SURFACE FIX.	0	EA	1.50	0		0			367	0	0
								SUB-TOTAL			494.24
								CITY COST (10%)			49.42
NOTE:								PROFIT (10%)			49.42
1) Prices for fixture includes cost for electronic ballast & energy saving lamps								O/H (15%)			74.14
								TOTAL			667.22
										SAY	$670

DA FORM 5418-R, Apr 85 CONTD

LIFE CYCLE COST ANALYSIS SUMMARY
ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP)

LOCATION: ______ REGION NO. ____ PROJECT NUMBER ______

PROJECT TITLE *INSTALL NEW Fluor. FIX.* FISCAL YEAR ______

DISCRETE PORTION NAME *Unit Type 60-I*

ANALYSIS DATE ______ ECONOMIC LIFE *25* YEARS PREPARED BY ____

1. INVESTMENT COSTS

A.	CONSTRUCTION COST	$ *670.00*
B.	SIOH (*5.5%*)	$ *36.85*
C.	DESIGN COST (*10%*)	$ *67.00*
D.	ENERGY CREDIT CALC (1A+1B+1C)X.9	$ *696.47*
E.	SALVAGE VALUE OF EXISTING EQUIPMENT	$
F.	TOTAL INVESTMENT (1D-1E)	$ *696.47*

2. ENERGY SAVINGS (+) / COST (-)
ANALYSIS DATE ANNUAL SAVINGS, UNIT COST $ DISCOUNTED SAVINGS

FUEL	COST $/MBTU(1)	SAVINGS MBTU/YR(2)	ANNUAL $ SAVINGS(3)	DISCOUNT FACTOR(4)	DISCOUNTED SAVINGS(5)
A. ELEC	$ *19.96*	*0.259/unit*	$ *5.17*	*12.12*	$ *62.66*
B. DIST	$		$		$
C. RESID	$		$		$
D. NG	$		$		$
E. COAL	$		$		$
F. TOTAL			$ *5.17*		$ *62.66*

3. NON ENERGY SAVINGS (+) / COST (-)
   A. ANNUAL RECURRING (+/-) $ *0*
      (1) DISCOUNT FACTOR (TABLE 1) ______
      (2) DISCOUNTED SAVING/COST (3A X 3A1) $ *0*

   B. NON RECURRING SAVINGS (+) / COST (-)

ITEM	SAVINGS $ (+) COST $ (-)(1)	YEAR OF OCCURRENCE(2)	DISCOUNT FACTOR (3)	DISCOUNTED SAVINGS (+) COST(-)(4)
a.	$			$
b.	$			$
c.	$			$
d. TOTAL	$			$

   C. TOTAL NON ENERGY DISCOUNTED SAVINGS (+) / COST (-) (3A2+3Bd4) $ ____

   D. PROJECT NON ENERGY QUALIFICATION TEST
   (1) 25% MAX NON ENERGY CALC (2F5 X .33) $ *20.68*
      a. IF 3D1 IS = OR 3C GO TO ITEM 4
      b. IF 3D1 IS 3C CALC SIR = (2F5+3D1) : 1F = ______
      c. IF 3D1b IS = 1 GO TO ITEM 4
      d. IF 3D1b IS 1 PROJECT DOES NOT QUALIFY

4. FIRST YEAR DOLLAR SAVINGS 2F3+3A+(3B1d : YEARS ECONOMIC LIFE) $ *5.17*

5. TOTAL NET DISCOUNTED SAVINGS (2F5+3C) $ *62.66*

6. SIR (IF 1 PROJECT DOES NOT QUALIFY) (SIR)=(5 : 1F)= *0.09*

UNIT TYPE	LOCATION	LIGHTING SAVINGS (W)	HRS PER DAY IN OPERATION	DAILY SAVINGS (KWH)
60-II	KITCHEN	26	4	0.104
	BATH	22	4	0.088
TOTAL			=	0.192

ANNUAL ENERGY SAVINGS

$$= 0.192 \text{ KWH/day} \times 365 \text{ day/yr} = 70 \text{ KWH/yr}$$

ANNUAL COST SAVINGS

$$= 70 \text{ KWH/yr} \times (\$0.068 \text{ /yr}) = \$4.76$$

Cost of new energy saving fluor. fixtures = $ 610
(see attached)

$$\text{Payback} = \frac{\$610}{\$4.76 \text{ /yr}} = 128.2 \text{ yrs}$$

SIR = 0.09 (see attached)

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CONSULTING MECHANICAL & ELECTRICAL ENGINEERS
2130-E North King Street Honolulu, Hawaii 96819
Telephone (808) 847-6557 Telefax: (808) 847-6550

DATE: JOB No.:
PROJECT NAME: BY:
SUBJECT: Sht. Of 3-95

LABOR RATE : $21.81 + 75% LB = 38. SAY 38.20

PROJECT: INSTALL NEW FLUOR. FIXTURES | ESTIMATOR | CHECKED BY | SHEET OF SHEETS

TASK DESCRIPTION	QUANTITY: NO. OF UNITS	QUANTITY: UNIT MEAS	LABOR: MH/UNIT	LABOR: TOTAL HRS	LABOR: UNIT PRICE	LABOR: COST	EQUIPMENT: UNIT PRICE	EQUIPMENT: COST	MATERIAL: UNIT PRICE	MATERIAL: COST	TOTAL
Unit Type 60-II											
Remove Exst fixture	2	EA	0.5	1.0	38.20	38.20					38.20
NEW SINGLE LAMP, SURFACE FIXTURE	1	EA.	1.0	1.0		38.20			151	151	189.20
NEW 2 LAMP, SURFACE FIX.	1	EA	1.10	1.10		42.02			186	186	228.02
NEW 4 LAMP, SURFACE FIX.	0	EA	1.50						367		0
								SUBTOTAL			455.42
								CITY COST (10%)			45.54
NOTE:								PROFIT (10%)			45.54
1) Prices for fixture includes cost for electronic ballast & energy saving lamps								O/H (15%)			68.31
								TOTAL			614.81
										SAY	$610

DA FORM 5418-R, Apr 85 CONTD

LIFE CYCLE COST ANALYSIS SUMMARY
ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP)

LOCATION: ______ REGION NO. ____ PROJECT NUMBER ______

PROJECT TITLE INSTALL NEW FLUOR. FIX. FISCAL YEAR ______

DISCRETE PORTION NAME Unit Type 60-II

ANALYSIS DATE ______ ECONOMIC LIFE 25 YEARS PREPARED BY ______

1. INVESTMENT COSTS
   - A. CONSTRUCTION COST $ 610.00
   - B. SIOH (5.5%) $ 33.55
   - C. DESIGN COST (10%) $ 61.00
   - D. ENERGY CREDIT CALC (1A+1B+1C)X.9 $ 634.10
   - E. SALVAGE VALUE OF EXISTING EQUIPMENT $ ______
   - F. TOTAL INVESTMENT (1D-1E) $ 634.10

2. ENERGY SAVINGS (+) / COST (-)
   ANALYSIS DATE ANNUAL SAVINGS, UNIT COST $ DISCOUNTED SAVINGS

FUEL	COST $/MBTU(1)	SAVINGS MBTU/YR(2)	ANNUAL $ SAVINGS(3)	DISCOUNT FACTOR(4)	DISCOUNTED SAVINGS(5)
A. ELEC	$ 19.92	0.239/unit	$ 4.76	12.12	$ 57.69
B. DIST	$		$		$
C. RESID	$		$		$
D. NG	$		$		$
E. COAL	$		$		$
F. TOTAL			$ 4.76		$ 57.69

3. NON ENERGY SAVINGS (+) / COST (-)
   - A. ANNUAL RECURRING (+/-) $ 0
     - (1) DISCOUNT FACTOR (TABLE 1) ______
     - (2) DISCOUNTED SAVING/COST (3A X 3A1) $ 0
   - B. NON RECURRING SAVINGS (+) / COST (-)

ITEM	SAVINGS $ (+) COST $ (-)(1)	YEAR OF OCCURRENCE(2)	DISCOUNT FACTOR (3)	DISCOUNTED SAVINGS (+) COST(-)(4)
a.	$			$
b.	$			$
c.	$			$
d. TOTAL	$			$

   - C. TOTAL NON ENERGY DISCOUNTED SAVINGS (+) / COST (-) (3A2+3Bd4) $ ______
   - D. PROJECT NON ENERGY QUALIFICATION TEST
     - (1) 25% MAX NON ENERGY CALC (2F5 X .33) $ 19.04
       - a. IF 3D1 IS = OR 3C GO TO ITEM 4
       - b. IF 3D1 IS 3C CALC SIR = (2F5+3D1) : 1F = ______
       - c. IF 3D1b IS = 1 GO TO ITEM 4
       - d. IF 3D1b IS 1 PROJECT DOES NOT QUALIFY

4. FIRST YEAR DOLLAR SAVINGS 2F3+3A+(3B1d : YEARS ECONOMIC LIFE) $ 4.76

5. TOTAL NET DISCOUNTED SAVINGS (2F5+3C) $ 57.69

6. SIR (IF 1 PROJECT DOES NOT QUALIFY) (SIR)=(5 : 1F)= 0.09

UNIT TYPE	LOCATION	LIGHTING SAVINGS (W)	HRS PER DAY IN OPERATION	DAILY SAVINGS (KWH)
60-III	KITCHEN	26	4	0.104

ANNUAL ENERGY SAVINGS
$= 0.104 \text{ kwH/day} \times 365 \text{ day/yr} = 38 \text{ KwH/yr}$

ANNUAL COST SAVINGS
$= 38 \text{ kwH/yr} \times (\$0.068 \text{ /yr}) = \$2.58$

Cost of new energy saving fluor. fixtures = \$330
(see attached)

$$\text{Payback} = \frac{\$330}{\$2.58 \text{ /yr}} = 127.9 \text{ yrs}$$

SIR = 0.09 (see attached)

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Telephone (808) 847-6557 Telefax: (808) 847-6550

DATE: JOB No.:
PROJECT NAME: BY:
SUBJECT:

LABOR RATE : \$21.81 + 75% LB = 38. SAY 38.20

PROJECT INSTALL NEW FLUOR. FIXTURES						ESTIMATOR		CHECKED BY	SHEET OF		SHEETS
	QUANTITY		LABOR				EQUIPMENT		MATERIAL		
TASK DESCRIPTION Unit Type 60-III	NO. OF UNITS	UNIT MEAS	MH/UNIT	TOTAL HRS	UNIT PRICE	COST	UNIT PRICE	COST	UNIT PRICE	COST	TOTAL
Remove Exst Fixture	1	EA	0.5	0.5	38.20	19.10					19.10
NEW SINGLE LAMP,	0	EA.	1.0			0			151	0	0
SURFACE FIXTURE											
NEW 2 LAMP, SURFACE FIX.	1	EA	1.10	1.10		42.02			186	186	228.02
NEW 4 LAMP, SURFACE FIX.	0	EA	1.50						367		0
								SUBTOTAL			247.12
								CITY	COST	(10%)	24.71
NOTE :								PROFIT		(10%)	24.71
a) Prices for fixture includes cost for								O/H	(15%)		37.07
electronic ballast & energy saving lamps											
								TOTAL		-	333.61
										SAY	\$330

DA FORM 5418-R, Apr 85 CONTD

LIFE CYCLE COST ANALYSIS SUMMARY
ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP)

LOCATION: ______ REGION NO. ____ PROJECT NUMBER ______

PROJECT TITLE INSTALL NEW Fluor. FIX. FISCAL YEAR ______

DISCRETE PORTION NAME UNIT TYPE 60-III

ANALYSIS DATE ______ ECONOMIC LIFE 25 YEARS PREPARED BY ______

1. INVESTMENT COSTS
   A. CONSTRUCTION COST $ 330.00
   B. SIOH (5.5%) $ 18.15
   C. DESIGN COST (10%) $ 33.00
   D. ENERGY CREDIT CALC (1A+1B+1C)X.9 $ 343.04
   E. SALVAGE VALUE OF EXISTING EQUIPMENT $ ______
   F. TOTAL INVESTMENT (1D-1E) $ 343.04

2. ENERGY SAVINGS (+) / COST (-)
   ANALYSIS DATE ANNUAL SAVINGS, UNIT COST $ DISCOUNTED SAVINGS

FUEL	COST $/MBTU(1)	SAVINGS MBTU/YR(2)	ANNUAL $ SAVINGS(3)	DISCOUNT FACTOR(4)	DISCOUNTED SAVINGS(5)
A. ELEC	$19.85	0.130/unit	$2.58	12.12	$31.27
B. DIST	$		$		$
C. RESID	$		$		$
D. NG	$		$		$
E. COAL	$		$		$
F. TOTAL			$2.58		$31.27

3. NON ENERGY SAVINGS (+) / COST (-)
   A. ANNUAL RECURRING (+/-) $ 0
      (1) DISCOUNT FACTOR (TABLE 1) ______
      (2) DISCOUNTED SAVING/COST (3A X 3A1) $ 0

   B. NON RECURRING SAVINGS (+) / COST (-)

ITEM	SAVINGS $ (+) COST $ (-)(1)	YEAR OF OCCURRENCE(2)	DISCOUNT FACTOR (3)	DISCOUNTED SAVINGS (+) COST(-)(4)
a.	$			$
b.	$			$
c.	$			$
d. TOTAL	$			$

   C. TOTAL NON ENERGY DISCOUNTED SAVINGS (+) / COST (-) (3A2+3Bd4) $ ______

   D. PROJECT NON ENERGY QUALIFICATION TEST
   (1) 25% MAX NON ENERGY CALC (2F5 X .33) $ 10.32
      a. IF 3D1 IS = OR 3C GO TO ITEM 4
      b. IF 3D1 IS 3C CALC SIR = (2F5+3D1) : 1F = ______
      c. IF 3D1b IS = 1 GO TO ITEM 4
      d. IF 3D1b IS 1 PROJECT DOES NOT QUALIFY

4. FIRST YEAR DOLLAR SAVINGS 2F3+3A+(3B1d : YEARS ECONOMIC LIFE) $ 2.58

5. TOTAL NET DISCOUNTED SAVINGS (2F5+3C) $ 31.27

6. SIR (IF 1 PROJECT DOES NOT QUALIFY) (SIR)=(5 : 1F)= 0.09

Electronic Ballast Technology represented by Inter-Island ~~Tech~~. Industrial

EBT Ballast Guide

RAPID START BALLAST (Series Connection)*

LAMPS	LAMP TYPE	LAMP LENGTH	LAMP WATTS	INPUT VOLTS	LINE AMPS	INPUT WATTS	ORDERING CODE
1 (1)	F40T12/RS	4'	34	120	.25	28	SSB1-120-1/40
			40		.32	35	
			34	277	.11	28	SSB1-277-1/40
			40		.13	35	
2 (1)	F40T12/RS	4'	34	120	.50	57	SSB1-120-2/40
			40		.61	69	
			34	277	.21	57	SSB1-277-2/40
			40		.27	69	
2 (2)	F032T8/RS	4'	32	120	.55	62	SSB1-120-2/32
				277	.24		SSB1-277-2/32
2 (1)	F40T12/RS	4'	34	120	.64	72	SSB1-120-2/40MPX
			40		.74	84	
			34	277	.27	72	SSB1-277-2/40MPX
			40		.31	84	
2	F40T12/RS	4'	34	120	.53	59	SSB1-120-2/40MINI†
			40		.64	71	
			34	277	.23	59	SSB1-277-2/40MINI†
			40		.28	71	
	F025T8	3'	25	120	.45	51	SSB1-120-2/32MINI†
	F032T8	4'	32		.58	64	
	F025T8	3'	25	277	.20	51	SSB1-277-2/32MINI†
	F032T8	4'	32		.25	64	
3 (1)	F40T12/RS	4'	34	120	.80	90	SSB1-120-3/40
			40		.93	105	
			34	277	.34	90	SSB1-277-3/40
			40		.41	105	
3 (2)	F032T8/RS	4'	32	120	.82	92	SSB1-120-3/32
				277	.35		SSB1-277-3/32
2 (3)	F96T12/HO	8'	95	120	1.45	160	SSB1-120-2/96HO
			110		1.70	190	
			95	277	.63	160	SSB1-277-2/96HO
			110		.74	190	

INSTANT START BALLAST (Parallel Connection)**

LAMPS	LAMP TYPE	LAMP LENGTH	LAMP WATTS	INPUT VOLTS	LINE AMPS	INPUT WATTS	ORDERING CODE
2	F025T8	3'	25	120	.48	52	SSB2-120-3/32IS
	F032T8	4'	32		.59	66	
	F040T8	5'	40		.71	80	
	F025T8	3'	25	277	.21	52	SSB2-277-3/32IS
	F032T8	4'	32		.26	66	
	F040T8	5'	40		.31	80	
3	F025T8	3'	25	120	.60	67	SSB2-120-3/32IS
	F032T8	4'	32		.78	88	
	F040T8	5'	40		.94	106	
	F025T8	3'	25	277	.26	67	SSB2-277-3/32IS
	F032T8	4'	32		.34	88	
	F040T8	5'	40		.41	106	
4 (4)	F025T8	3'	25	120	.76	86	SSB2-120-4/32IS
	F032T8	4'	32		.97	109	
	F025T8	3'	25	277	.33	86	SSB2-277-4/32IS
	F032T8	4'	32		.43	109	
2 (5)	F96T12/IS	8'	60	120	.95	105	SSB2-120-2/96IS
			75		1.18	130	
			60	277	.41	105	SSB2-277-2/96IS
			75		.51	130	

LOW VOLTAGE POWER SUPPLY

[redacted]

* All SSB1 series ballasts are normal rapid start.
** All SSB2 series ballasts are instant start.
† MINI-BALLAST (1.15"H x 1.68"W x 9.2"L)
(1) Also compatible with F40T12/32W, 3" and 6" "U" tube (40W & 34W) and F30T12/RS 30W & 25W lamps.
(2) Also compatible with F025T8 and F040T8 lamps.
(3) Also compatible with F60, F64, F72 and F84T12/HO lamps.
(4) Also compatible with F017T8 lamps. Can be substituted in place of 3 lamp.
(5) Also compatible with F60, F64, F72 and F84T12IS lamps.

3.4 Replace Kitchen Light Fixtures

The existing kitchen lights that are fluorescent fixtures can be changed to energy efficient lamps and electronic ballasts. Existing incadescent light fixtures can be fitted with fluorescent retrofit adapters.

See Section 3.2 Replace Incadescent Lighting and
Section 3.3 Energy Conserving Fluorescent Light and Ballast

3.5 Use more Efficient Lighting Source

See Section 3.2 Replace Incadescent Lighting
Section 3.3 Energy Conserving fluorescent Light and Ballast

3.6 Reflectors for Fluorescent Light Fixtures

Retrofitting existing fluorescent lights with reflectors is usually only done in projects where there are a large number of identical fixtures, such as in a multi-story office building. Each reflector must be individually designed and manufactured for a particular light fixture with first costs between $300 - $500 if orders are for less than one hundred units. In the case of the family housing units in this project, installation of the fluorescent fixtures was done piecemeal over a long period of time so that there are many different models in use. Therefore, the use of light reflectors would not be practical.

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PROJECT NAME: BY:
SUBJECT:

3.7 Occupancy Sensors to Control Lighting

This would not be a practical option for a family housing environment. Occupancy sensors are typically used for hotel room type applications.

3.8 Photocells to Control Lighting

Photocells are not a practical option for a family housing environment.

3.9 Separate Switches to Control Lighting

The existing switch control of the lighting is adequate.

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PROJECT NAME: | BY:
SUBJECT: | Sht. Of 3-104

3.10 Reduce Street Lighting

From information on as-built drawings showing the placement of the light poles and assuming that all poles have a 100W fixture, the existing lighting levels appear proper and reduction of lighting is not recommended.

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PROJECT NAME: | BY:
SUBJECT: | Sht. 3-105 Of

4. Hot Water

4.1 Control Hot Water Circulation Pump

Not applicable, there are no existing HW circulation pumps in any of the unit types in this study.

4.2 Heat Reclaim from Family Housing Condensers

Not applicable, none of the Unit types in this study have central air conditioning systems.

4.3 Heat Reclaim from Hot Refrigerant Gas

Not applicable, none of the unit types in this study have central air conditioning systems.

4.4 Instantaneous Hot Water Heater

1. Background

a. The existing HW system for all unit types consists of a single storage type electric Hot water heater with a heat pump that supplies the entire house unit.

b. The HW system can be decentralized through the use of individual instantaneous hot water heaters at each location requiring hot water (Kitchen, Baths, Toilets).

2. Assumptions:

a. $h_{air} = 0.5$ BTU/Hr-SF for pipe in still air

b. $h_f = 1,000$ BTU/Hr for water

c. Avg. Air Temp. = 75°F

d. $K = 223$ BTU/Hr-F for copper pipe

e. R = 16 for exist Hoyt FES EWH

f. COP = 3.0 for exist. Feeder Heat Pump

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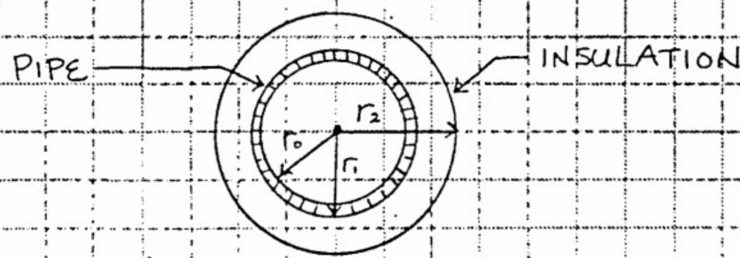
DATE:	JOB No.:
PROJECT NAME:	BY:
SUBJECT:	Sht. Of 4-2



$$\sum \frac{R}{L}_{UNINS} = \left[\frac{1}{h_f r_0} + \frac{\ln(r_1/r_0)}{K_{pipe}} + \frac{1}{h_{air} r_1}\right]\frac{1}{2\pi}$$

$$\theta = \frac{\Delta T}{\Sigma R}$$

3. Heat Loss Calculations

a. Piping

$$\sum \frac{R}{L}_{uninsl, 3/4"} = \left[\frac{1}{1000(.785/12)} + \frac{\ln(.875/.785)}{223} + \frac{1}{0.5(.875/12)}\right]\frac{1}{2\pi}$$

$$= 4.4$$

$$\sum \frac{R}{L}_{UNINSL, 1/2"} = \left[\frac{1}{1000(.545/12)} + \frac{\ln(.625/.545)}{223} + \frac{1}{.5(.625/12)}\right]\frac{1}{2\pi}$$

$$= 6.1$$

Pipe Size	$\Sigma R/L$	*HW PIPE LENGTH	ΔT	Heat Loss $\theta = \Delta T/\Sigma R$	Daily Energy Savings
3/4"	4.4	50	(120-75)	511	12,264
1/2"	6.1	10	(120-75)	74	1,776
TOTAL					14,040 BTU/DAY

* Run to furthest bath for all unit types

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SUBJECT: | Sht. 4-3 Of

6. Water Heater Storage

Tank Size = 22"ϕ × 5'-0"

$U = 1/R = 1/16 = 0.06$

$Q = \left[(22/12)\pi \times 5' \right] \times 0.06 \ ^{BTUH}/_{F\text{-}SF} \times [120-75]$

$= 78 \text{ BTUH} \times 24 \ ^{HR}/_{Day} = 1,872 \text{ BTU/Day}$

4. Evaluate Heat Loss

Total Heat Loss = $[1,872 + 14,040] = 15,912 \ ^{BTU}/_{Day}$

ANNUAL ENERGY SAVINGS

$= 15,912 \ ^{BTU}/_{Day} \times 365 \ ^{Day}/_{yr} = 5.81 \ ^{MBTU}/_{yR}$

OR $\dfrac{5.81 \ ^{MBTU}/_{YR}}{(3413 \ ^{BTUH}/_{KW})(3.0)} = 567 \ ^{KWH}/_{yr}$

ANNUAL COST SAVINGS

$= 567 \ ^{KWH}/_{yr} \times (\$0.068/KWH) = \$38.56$

Cost for Instantaneous EWH's : \$1424
(see attached)

Payback $= \dfrac{\$1424}{\$38.56} = 36.9$ yrs

SIR = 0.11 (see attached)

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∴ Installing Instantaneous water heaters would not be cost effective.

Since, this analysis was done for the worst case of non-insulated lines and the longest piping run, it can be assumed that instantaneous water heaters would not be cost effective for any unit type.

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SUBJECT:	Sht. 4-5 Of

... LABOR RATE: ... 15% = 38.20

Pl... LABOR RATE: $22.00 + 80% = 39.[illegible]

PROJECT							ESTIMATOR	CHECKED BY		SHEET	OF	SHEETS
TASK DESCRIPTION	QUANTITY		LABOR				~~EQUIPMENT~~ HATL		~~MATERIAL~~ ENGINEER		TOTAL
	NO. OF UNITS	UNIT MEAS	MH/UNIT	TOTAL HRS	UNIT PRICE	COST	UNIT PRICE	COST	UNIT PRICE	COST	
Instantaneous Water Heater	1	EA	5	5	39.60	158.40	675	675.00			833.40
(3 gpm max.)											
Conduit, 3/4"	65	LF	.055	3.58	38.20	136.76	0.52	38.80			175.56
#10 Wire, copper	2.60	CLF	0.8	2.08	38.20	79.45	19.50	50.70			130.15
									SUBTOTAL		1,139.11
									O/H (15%)		170.86
									PROFIT (10%)		113.91
									TOTAL		1,423.88
										SAY $	1424

LIFE CYCLE COST ANALYSIS SUMMARY
ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP)

LOCATION: ____________ REGION NO. ____ PROJECT NUMBER ____________

PROJECT TITLE Instantaneous EWH FISCAL YEAR ________

DISCRETE PORTION NAME ________________

ANALYSIS DATE ____________ ECONOMIC LIFE 15 YEARS PREPARED BY ____

1. INVESTMENT COSTS
   A. CONSTRUCTION COST $ 1,424
   B. SIOH (5.5%) $ 78
   C. DESIGN COST (10%) $ 142
   D. ENERGY CREDIT CALC (1A+1B+1C)X.9 $ 1,480
   E. SALVAGE VALUE OF EXISTING EQUIPMENT $ —
   F. TOTAL INVESTMENT (1D-1E) $ 1480

2. ENERGY SAVINGS (+) / COST (-)
   ANALYSIS DATE ANNUAL SAVINGS, UNIT COST $ DISCOUNTED SAVINGS

FUEL	COST $/MBTU(1)	SAVINGS MBTU/YR(2)	ANNUAL $ SAVINGS(3)	DISCOUNT FACTOR(4)	DISCOUNTED SAVINGS(5)
A. ELEC	$ 6.64	5.81	$ 38.56	9.32	$ 359.38
B. DIST	$		$		$
C. RESID	$		$		$
D. NG	$		$		$
E. COAL	$		$		$
F. TOTAL			$ 38.56		$ 359.38

3. NON ENERGY SAVINGS (+) / COST (-)
   A. ANNUAL RECURRING (+/-) $ 0
      (1) DISCOUNT FACTOR (TABLE 1) ______
      (2) DISCOUNTED SAVING/COST (3A X 3A1) $ 0

   B. NON RECURRING SAVINGS (+) / COST (-)

ITEM	SAVINGS $ (+) COST $ (-)(1)	YEAR OF OCCURRENCE(2)	DISCOUNT FACTOR (3)	DISCOUNTED SAVINGS (+) COST(-)(4)
a.	$			$
b.	$			$
c.	$			$
d. TOTAL	$			$

   C. TOTAL NON ENERGY DISCOUNTED SAVINGS (+) / COST (-) (3A2+3Bd4) $ ______

   D. PROJECT NON ENERGY QUALIFICATION TEST
   (1) 25% MAX NON ENERGY CALC (2F5 X .33) $ 118.59
      a. IF 3D1 IS = OR 3C GO TO ITEM 4
      b. IF 3D1 IS 3C CALC SIR = (2F5+3D1) : 1F = ______
      c. IF 3D1b IS = 1 GO TO ITEM 4
      d. IF 3D1b IS 1 PROJECT DOES NOT QUALIFY

4. FIRST YEAR DOLLAR SAVINGS 2F3+3A+(3B1d : YEARS ECONOMIC LIFE) $ 38.56

5. TOTAL NET DISCOUNTED SAVINGS (2F5+3C) $ 359.38

6. SIR (IF 1 PROJECT DOES NOT QUALIFY) (SIR)=(5 : 1F)= 0.11

4-7

4.5 Decentralize Domestic Hot Water Heaters

See Section 4.4 Instantaneous Hot Water Heaters

4.6 Install Shower Flow Restrictors / Limited Flow Showerheads

Background:

All the existing showerheads for all unit types are the same except for where residents have changed them out for their own personal shower heads.

Assumptions:

a. Flowrates from the same type of head will be approx. the same. One average flowrate, using data from all unit types (w/ the originally provided head), will be calculated.

Avg. Shwr flowrate = 0.21 liter/s

$$\text{OR} = (0.21\ \ell/s)\left(\frac{1\ gal}{3.78\ \ell}\right)\left(\frac{60\ s}{min}\right) = 3.3\ gpm$$

b. Min. Req'd flowrate @ Shwr = 3.0 gpm

c. Measurements were taken only to nearest 0.5 liter ∴ the uncertainty is

$$(0.5\ell/10s)(1/3.78\ gal/\ell)(60\ s/min) = 0.8\ gpm$$

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PROJECT NAME: BY:

SUBJECT:

The existing flowrates at the showerheads are already within an acceptable range to the minimum required, and flow restrictors are not applicable.

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DATE:	JOB No.:
PROJECT NAME:	BY:
SUBJECT:	Sht. Of 4-9

4.7 Domestic HW Heat Pumps

1. Background:

The existing HW system for all units consists of a single storage type electric water heater with heat pump that supplies the entire house unit. However, during our survey we found that a large number of the heat pumps are broken and have been abandoned instead of fixed or replaced. *

2. Assumptions:

a. COP = 3.0 for new heat pump replacement

b. 1 shwr per resident per day

c. D/W used once per day

d. # Loads per week = 1.5 x (# of Residents)

* approximately 20% of the units surveyed had broken heat pumps.

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DATE: JOB No.:
PROJECT NAME: BY:
SUBJECT:

3. Estimated Daily HW Usage

a. For SHOWERS:

Unit Type	Avg. # Residents	Avg. Shwr GPM	Avg. Shwr Time (min.)	Daily HW Usage (Gal)
20-II	6	3	20	360
20-III	4	3	20	240
20-IV	6	3	20	360
20-V	3	3	20	180
20-VI	Unit not seen			
32-I	3	3	20	180
32-II	Same as Unit type 32-I			
32-III	3	3	20	180
32-IV	5	3	20	300
57-I	2	3	20	120
57-II	4	3	20	240
57-III	4	3	20	240
57-IV	Same as Unit Type 57-II			
57-V	3	3	20	180
57-VI	Same as Unit Type 57-II			
57-VII	Same as Unit Type 57-V			
57-VIII	Same as Unit Type 57-II			
57-IX	Same as Unit Type 57-II			
60-I	3	3	20	180
60-II	5	3	20	300
60-III	4	3	20	240
71-I	5	3	20	300

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DATE: JOB No.:

PROJECT NAME: BY:

SUBJECT:

b. Laundry

Unit Type	# of RESID.	LOADS PER RESID.	TOTAL LOADS/wk	HW PER LOAD	DAILY HW USAGE
20-II	6	1.5	9	10	12.9
20-III	4		6		8.6
20-IV	6		9		12.9
20-V	3		4.5		6.4
32-I	3		4.5		6.4
32-III	3		4.5		6.4
32-IV	5		7.5		10.7
57-I	2		3		4.3
57-II	4		6		8.6
57-III	4		6		8.6
57-V	3		4.5		6.4
60-I	3		4.5		6.4
60-II	5		7.5		10.7
60-III	4		6		8.6
71-I	5		7.5		10.7

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PROJECT NAME: | BY:
SUBJECT: | Sht. Of 4-12

c. Dishwasher:

$(1\ \text{LOAD/Day}) \times (4\ \text{GAL/wash}) = 4\ \text{gpd}$

For units w/o dishwasher

$(3\ \text{LOAD/Day})(4\ \text{GAL/WASH}) = 12\ \text{gpd}$

d. Handwashing

Unit Type	# OF RESIDENTS	WASHES PER PERSON (gal)	GAL. PER WASH (gal)	DAILY HW Usage (gpd)
20-II	6	2	1	12
20-III	4			8
20-IV	6			12
20-V	3			6
32-I	3			6
32-III	3			6
32-IV	5			10
57-I	2			4
57-II	4			8
57-III	4			8
57-V	3			6
60-I	3			6
60-II	5			10
60-III	4			8
71-I	5			10

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DATE: JOB No.:
PROJECT NAME: BY:
SUBJECT:

f. Total Daily HW Usage

Unit Type	Shwrs (gpd)	Laund (gpd)	D/W (gpd)	FooD PREP. (gpd)	TOTAL (gpd)
20-II	360	12.9	12	12	396.9
20-III	240	8.6	8	8	264.6
20-IV	360	12.9	12	12	396.9
20-V	180	6.4	6	6	198.4
32-I	180	6.4	6	6	198.4
32-III	180	6.4	6	6	198.4
32-IV	300	10.7	10	10	330.7
57-I	120	4.3	4	4	132.3
57-II	240	8.6	8	8	264.6
57-III	240	8.6	8	8	264.6
57-V	180	6.4	6	6	198.4
60-I	180	6.4	6	6	198.4
60-II	300	10.7	10	10	330.7
60-III	240	8.6	8	8	264.6
71-I	300	10.7	10	10	330.7

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DATE: JOB No.:
PROJECT NAME: BY:
SUBJECT:

4. Evaluate Energy Use for HW heating

a. Unit Type 20-II

Energy Use w/o heat pump

$$\frac{[(397 \text{ gal/day}) \times (1 \text{ BTU/lb-F}) \times (8.33 \text{ lb/gal})(120-70F)]}{(3413 \text{ BTUH/KW})}$$

$= 48.4$ KWH/Day

Energy use w/ heat pump

$$\frac{[(397 \text{ gal/day}) \times (1 \text{ BTU/lb-F}) \times (8.33 \text{ lb/gal})(120-70F)]}{(3413 \text{ BTUH/KW})(3.0 \text{ COP})}$$

$= 16.1$ KWH/day

Energy savings $= 48.4 - 16.1$ KWH/day $= 32.3$ KWH/day

ANNUAL ENERGY SAVINGS
$= 32.3$ KWH/day $\times$ 365 day/yr $=$ 11,790 KWH/yr

ANNUAL COST SAVINGS
$=$ 11,790 KWH/yr $\times$ (\$0.068 /KWH) $=$ \$ 801.72

Cost for Heat Pump Replacement $=$ \$ 1700.00
(see attached)

Payback $= \frac{\$ 1700}{\$ 801.72 \text{/yr}} = 2.1$ yrs

SIR $= 4.23$ (see attached)

Replacing broken heat pumps is cost effective

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DATE:	JOB No.:
PROJECT NAME:	BY:
SUBJECT:	Sht. Of 4-16

Li 2 RATE : $22.00 + 80% = $39.60

PROJECT Replace Broken Heat Pumps | ESTIMATOR | CHECKED BY | SHEET OF SHEETS

TASK DESCRIPTION	QUANTITY		LABOR				EQUIPMENT		MATERIAL		TOTAL
	NO. OF UNITS	UNIT MEAS	MH/UNIT	TOTAL HRS	UNIT PRICE	COST	UNIT PRICE	COST	UNIT PRICE	COST	
New Heat Pump	1	EA	4	4	39.60	158.40			1120	1120.00	1,278.40
									SUBTOTAL		1,278.40
									O/H (15%)		191.76
									Profit (10%)		147.02
									TAX (4%)		64.69
									BOND (1%)		16.82
									TOTAL		1698.69
									SAY	$1700	

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LIFE CYCLE COST ANALYSIS SUMMARY
ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP)

LOCATION: ____________ REGION NO. ____ PROJECT NUMBER ____________

PROJECT TITLE Replace Broken Heat Pumps FISCAL YEAR ________

DISCRETE PORTION NAME Unit Type 20-II

ANALYSIS DATE ____________ ECONOMIC LIFE 15 YEARS PREPARED BY ____

1. INVESTMENT COSTS
   - A. CONSTRUCTION COST $ 1700.00
   - B. SIOH (5.5%) $ 93.50
   - C. DESIGN COST (10%) $ 170.00
   - D. ENERGY CREDIT CALC (1A+1B+1C)X.9 $ 1767.15
   - E. SALVAGE VALUE OF EXISTING EQUIPMENT $ —
   - F. TOTAL INVESTMENT (1D-1E) $ 1767.15

2. ENERGY SAVINGS (+) / COST (-)
   ANALYSIS DATE ANNUAL SAVINGS, UNIT COST $ DISCOUNTED SAVINGS

FUEL	COST $/MBTU(1)	SAVINGS MBTU/YR(2)	ANNUAL $ SAVINGS(3)	DISCOUNT FACTOR(4)	DISCOUNTED SAVINGS(5)
A. ELEC	$ 19.92	40.239 /unit	$ 801.72	9.32	$ 7,472
B. DIST	$		$		$
C. RESID	$		$		$
D. NG	$		$		$
E. COAL	$		$		$
F. TOTAL			$ 801.72		$ 7,472

3. NON ENERGY SAVINGS (+) / COST (-)
   - A. ANNUAL RECURRING (+/-) $ 0
     - (1) DISCOUNT FACTOR (TABLE 1) ______
     - (2) DISCOUNTED SAVING/COST (3A X 3A1) $ 0
   - B. NON RECURRING SAVINGS (+) / COST (-)

ITEM	SAVINGS $ (+) COST $ (-)(1)	YEAR OF OCCURRENCE(2)	DISCOUNT FACTOR (3)	DISCOUNTED SAVINGS (+) COST(-)(4)
a.	$			$
b.	$			$
c.	$			$
d. TOTAL	$			$

   - C. TOTAL NON ENERGY DISCOUNTED SAVINGS (+) / COST (-) (3A2+3Bd4) $ ______
   - D. PROJECT NON ENERGY QUALIFICATION TEST
     - (1) 25% MAX NON ENERGY CALC (2F5 X .33) $ 2,465.76
       - a. IF 3D1 IS = OR 3C GO TO ITEM 4
       - b. IF 3D1 IS 3C CALC SIR = (2F5+3D1) : 1F = ______
       - c. IF 3D1b IS = 1 GO TO ITEM 4
       - d. IF 3D1b IS 1 PROJECT DOES NOT QUALIFY

4. FIRST YEAR DOLLAR SAVINGS 2F3+3A+(3B1d : YEARS ECONOMIC LIFE) $ 801.72

5. TOTAL NET DISCOUNTED SAVINGS (2F5+3C) $ 7,472

6. SIR (IF 1 PROJECT DOES NOT QUALIFY) (SIR)=(5 : 1F)= 4.23

Cost for Heat Pump Repair = $270.00
(see page 4-60C to 4-60E)

Payback = $\frac{\$270.00}{\$801.72/yr}$ = 0.34 year

SIR = 9.65
(see attached)

Repairing the heat pumps is more cost effective than replacing them.

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PROJECT NAME: | BY:

SUBJECT: | Sht. Of 4-18A

LIFE CYCLE COST ANALYSIS SUMMARY
ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP)

LOCATION: ______ REGION NO. ______ PROJECT NUMBER ______

PROJECT TITLE Repair Broken Heat Pumps FISCAL YEAR ______

DISCRETE PORTION NAME Unit Type 20-II

ANALYSIS DATE ______ ECONOMIC LIFE 4 YEARS PREPARED BY ______

1. INVESTMENT
   A. CONSTRUCTION COST $ 270.00
   B. SIOH (5.5%) $ 14.85
   C. DESIGN COST (10%) $ 27.00
   D. ENERGY CREDIT CALC (1A+1B+1C)X.9 $ 280.67
   E. SALVAGE VALUE - $ —
   F. TOTAL INVESTMENT (1D-1E) $ 280.67

2. ENERGY SAVINGS (+) / COST (-)
   ANALYSIS DATE ANNUAL SAVINGS, UNIT COST & DISCOUNTED SAVINGS

FUEL	COST $/MBTU/YR(1)	SAVINGS MBTU/YR(2)	ANNUAL $ SAVINGS(3)	DISCOUNT FACTOR(4)	DISCOUNTED SAVINGS(5)
A. ELEC	$ 19.92	40.239/unit	$ 801.72	3.38	$ 2,709.81
B. DIST	$		$		$
C. RESID	$		$		$
D. NG	$		$		$
E. COAL	$		$		$
F. TOTAL			$ 801.72		----------> $ 2,709.81

3. NONENERGY SAVINGS(+) / COST(-)
   A. ANNUAL RECURRING (+/-) $ 0
      (1) DISCOUNT FACTOR (TABLE A) ______
      (2) DISCOUNTED SAVING/COST (3A X 3A1) $ 0

   B. NONRECURRING SAVINGS(+) / COST(-)

ITEM	SAVINGS(+) COST (-)(1)	YEAR OF OCCURRENCE(2)	DISCOUNT FACTOR(3)	DISCOUNTED SAVINGS(+) COST(-)(4)
(1)	$			$
(2)	$			$
(3)	$			$
(4) TOTAL	$			$

   C. TOTAL NONENERGY DISCOUNTED SAVINGS(+) / COST(-) (3A2+3Bd4) $ ______

   D. PROJECT NONENERGY QUALIFICATION TEST
      (1) 25% MAX NONENERGY CALC (2F5 X .33) $ 894.24
         a. IF 3D1 IS = OR > 3C GO TO ITEM 4
         b. IF 3D1 IS < 3C CALC SIR = (2F5+3D1) ÷ 1F = ______
         c. IF 3D1b IS = > 1 GO TO ITEM 4
         d. IF 3D1b IS < 1 PROJECT DOES NOT QUALIFY

4. FIRST YEAR DOLLAR SAVINGS 2F3+3A+(3B1d ÷ YEARS ECONOMIC LIFE) $ 801.72

5. TOTAL NET DISCOUNTED SAVINGS (2F5+3C) $ 2,709.81

6. DISCOUNTED SAVINGS RATIO (IF < 1 PROJECT DOES NOT QUALIFY)(SIR)=(5 ÷ 1F)= 9.65

b. Unit Type 20-III

Energy use without heat pump:

$$\frac{[(265\ gal/day)(1\ BTU/lb\text{-}F)(8.33\ lb/gal)(120-70F)]}{(3413\ BTUH/KW)} = 32.3\ \frac{KWH}{Day}$$

Energy Use with heat pump:

$$\frac{[(265\ gal/day)(1\ BTU/lb\text{-}F)(8.33\ lb/gal)(120-70F)]}{(3413\ BTUH/kW)(3.0\ COP)} = 10.8\ \frac{KWH}{day}$$

Daily Energy Savings = 32.3 - 10.8 = 21.5 KWH/Day

ANNUAL ENERGY SAVINGS
= 21.5 KWH/day × (365 day/yr) = 7,848 kWH/yr

ANNUAL COST SAVINGS
= 7,848 KWH/yr × ($0.068 /KWH) = $ 533.66

Cost for heat pump replacement = $ 1,700
(see attached)

$$\text{Payback} = \frac{\$\ 1,700}{\$\ 533.66\ /yr} = 3.2\ yrs$$

SIR = 2.81 (see attached)

∴ Replacement of broken heat pump units would be cost effective.

CEDRIC D. O. CHONG & ASSOCIATES, INC.
CONSULTING MECHANICAL & ELECTRICAL ENGINEERS
2130-E North King Street Honolulu, Hawaii 96819
Telephone (808) 847-6557 Telefax: (808) 847-6550

DATE: | JOB No.:
PROJECT NAME: | BY:
SUBJECT:

P. Replace Broken Heat Pumps

TASK DESCRIPTION	QUANTITY		LABOR				EQUIPMENT		MATERIAL		TOTAL
	NO. OF UNITS	UNIT MEAS	MH/UNIT	TOTAL HRS	UNIT PRICE	COST	UNIT PRICE	COST	UNIT PRICE	COST	
New Heat Pump	1	EA	4	4	39.60	158.40			1120	1120.00	1,278.40
									SUBTOTAL		1,278.40
									O/H (15%)		191.76
									Profit (10%)		147.02
									TAX (4%)		64.69
									BOND (1%)		16.82
									TOTAL		1698.69
									SAY	$1700	

ESTIMATOR | CHECKED BY | SHEET OF SHEETS

DA FORM 5418-R, Apr 85 CONTD

LIFE CYCLE COST ANALYSIS SUMMARY
ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP)

LOCATION: ______ REGION NO. ______ PROJECT NUMBER ______

PROJECT TITLE Replace Broken Heat Pumps FISCAL YEAR ______

DISCRETE PORTION NAME Unit Type 20-III

ANALYSIS DATE ______ ECONOMIC LIFE 15 YEARS PREPARED BY ______

1. INVESTMENT
   A. CONSTRUCTION COST $ 1700.00
   B. SIOH (5.5%) $ 93.50
   C. DESIGN COST (10%) $ 170.00
   D. ENERGY CREDIT CALC (1A+1B+1C)X.9 $ 1767.15
   E. SALVAGE VALUE - $ —
   F. TOTAL INVESTMENT (1D-1E) $ 1767.15

2. ENERGY SAVINGS (+) / COST (-)
   ANALYSIS DATE ANNUAL SAVINGS, UNIT COST & DISCOUNTED SAVINGS

FUEL	COST $/MBTU/YR(1)	SAVINGS MBTU/YR(2)	ANNUAL $ SAVINGS(3)	DISCOUNT FACTOR(4)	DISCOUNTED SAVINGS(5)
A. ELEC	$ 19.92	26.79/unit	$ 533.66	9.32	$ 4,973.71
B. DIST	$		$		$
C. RESID	$		$		$
D. NG	$		$		$
E. COAL	$		$		$
F. TOTAL			$ 533.66		----------> $ 4,973.71

3. NONENERGY SAVINGS(+) / COST(-)
   A. ANNUAL RECURRING (+/-) $ 0
      (1) DISCOUNT FACTOR (TABLE A) ______
      (2) DISCOUNTED SAVING/COST (3A X 3A1) $ 0

   B. NONRECURRING SAVINGS(+) / COST(-)

ITEM	SAVINGS(+) COST (-)(1)	YEAR OF OCCURRENCE(2)	DISCOUNT FACTOR(3)	DISCOUNTED SAVINGS(+) COST(-)(4)
(1)	$			$
(2)	$			$
(3)	$			$
(4) TOTAL	$			$

   C. TOTAL NONENERGY DISCOUNTED SAVINGS(+) / COST(-) (3A2+3Bd4) $ ______

   D. PROJECT NONENERGY QUALIFICATION TEST
      (1) 25% MAX NONENERGY CALC (2F5 X .33) $ 1,641.32
         a. IF 3D1 IS = OR > 3C GO TO ITEM 4
         b. IF 3D1 IS < 3C CALC SIR = (2F5+3D1) ÷ 1F = ______
         c. IF 3D1b IS = > 1 GO TO ITEM 4
         d. IF 3D1b IS < 1 PROJECT DOES NOT QUALIFY

4. FIRST YEAR DOLLAR SAVINGS 2F3+3A+(3B1d ÷ YEARS ECONOMIC LIFE) $ 533.66

5. TOTAL NET DISCOUNTED SAVINGS (2F5+3C) $ 4,973.71

6. DISCOUNTED SAVINGS RATIO (IF < 1 PROJECT DOES NOT QUALIFY)(SIR)=(5 ÷ 1F)= 2.81

Cost for Heat Pump Repair = $270.00
(See page 4-60 C to 4-60E)

Payback = $\frac{\$270.00}{\$533.66}$ = 0.51 year

SIR = 6.42
(see attached

Repairing the heat pumps is more cost effective than replacing them.

CEDRIC D. O. CHONG & ASSOCIATES, INC.
CONSULTING MECHANICAL & ELECTRICAL ENGINEERS
2130-E North King Street Honolulu, Hawaii 96819
Telephone (808) 847-6557 Telefax: (808) 847-6550

DATE:
JOB No.:
PROJECT NAME:
BY:
SUBJECT:
Sht. 4-21A
01

LIFE CYCLE COST ANALYSIS SUMMARY
ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP)

LOCATION: ______ REGION NO. ______ PROJECT NUMBER ______

PROJECT TITLE Repair Broken Heat Pumps FISCAL YEAR ______

DISCRETE PORTION NAME Unit Type 20-III

ANALYSIS DATE ______ ECONOMIC LIFE 4 YEARS PREPARED BY ______

1. INVESTMENT
   A. CONSTRUCTION COST $ 270.00
   B. SIOH (5.5%) $ 14.85
   C. DESIGN COST (10%) $ 27.00
   D. ENERGY CREDIT CALC (1A+1B+1C)X.9 $ 280.67
   E. SALVAGE VALUE - $ —
   F. TOTAL INVESTMENT (1D-1E) $ 280.67

2. ENERGY SAVINGS (+) / COST (-)
   ANALYSIS DATE ANNUAL SAVINGS, UNIT COST & DISCOUNTED SAVINGS

FUEL	COST $/MBTU/YR(1)	SAVINGS MBTU/YR(2)	ANNUAL $ SAVINGS(3)	DISCOUNT FACTOR(4)	DISCOUNTED SAVINGS(5)
A. ELEC	$ 19.92	26.79/unit	$ 533.66	3.38	$ 1,803.77
B. DIST	$		$		$
C. RESID	$		$		$
D. NG	$		$		$
E. COAL	$		$		$
F. TOTAL			$ 533.66	---------->	$ 1,803.77

3. NONENERGY SAVINGS(+) / COST(-)
   A. ANNUAL RECURRING (+/-) $ 0
      (1) DISCOUNT FACTOR (TABLE A) ______
      (2) DISCOUNTED SAVING/COST (3A X 3A1) $ 0

   B. NONRECURRING SAVINGS(+) / COST(-)

ITEM	SAVINGS(+) COST (-)(1)	YEAR OF OCCURRENCE(2)	DISCOUNT FACTOR(3)	DISCOUNTED SAVINGS(+) COST(-)(4)
(1)	$			$
(2)	$			$
(3)	$			$
(4) TOTAL	$			$

   C. TOTAL NONENERGY DISCOUNTED SAVINGS(+) / COST(-) (3A2+3Bd4) $ ______

   D. PROJECT NONENERGY QUALIFICATION TEST
      (1) 25% MAX NONENERGY CALC (2F5 X .33) $ 595.24
         a. IF 3D1 IS = OR > 3C GO TO ITEM 4
         b. IF 3D1 IS < 3C CALC SIR = (2F5+3D1) ÷ 1F = ______
         c. IF 3D1b IS = > 1 GO TO ITEM 4
         d. IF 3D1b IS < 1 PROJECT DOES NOT QUALIFY

4. FIRST YEAR DOLLAR SAVINGS 2F3+3A+(3B1d ÷ YEARS ECONOMIC LIFE) $ 533.66

5. TOTAL NET DISCOUNTED SAVINGS (2F5+3C) $ 1803.77

6. DISCOUNTED SAVINGS RATIO (IF < 1 PROJECT DOES NOT QUALIFY)(SIR)=(5 ÷ 1F)= 6.42

c. Unit Type 20-IV

Energy use without heat pump:

$$\frac{\left[(397\ \text{gal/day})(1\ \text{BTU/lb-F})(8.33\ \text{lb/gal})(120-70\text{F})\right]}{(3413\ \text{BTUH/KW})} = 48.4\ \frac{\text{KWH}}{\text{Day}}$$

Energy Use with heat pump:

$$\frac{\left[(397\ \text{gal/day})(1\ \text{BTU/lb-F})(8.33\ \text{lb/gal})(120-70\text{F})\right]}{(3413\ \text{BTUH/KW})(3.0\ \text{COP})} = 16.1\ \frac{\text{KWH}}{\text{day}}$$

Daily Energy Savings = 48.4 - 16.1 = 32.3 KWH/Day

ANNUAL ENERGY SAVINGS
= 32.3 KWH/day × (365 day/yr) = 11,790 KWH/yr

ANNUAL COST SAVINGS
= 11,790 KWH/yr × ($0.068 /KWH) = $ 801.72

Cost for heat pump replacement = $1,700
(see attached)

$$\text{Payback} = \frac{\$\ 1700}{\$\ 801.72\ /\text{yr}} = 2.1\ \text{yrs}$$

SIR = 4.23 (see attached)

∴ Replacement of broken heat pump units would be cost effective.

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DATE: JOB No.:
PROJECT NAME: BY:
SUBJECT: Sht. 4-22 Of

P[illegible]T Replace Broken Heat Pumps | ESTIMATOR | CHECKED BY | SHEET OF SHEETS

TASK DESCRIPTION	QUANTITY: NO. OF UNITS	QUANTITY: UNIT MEAS	LABOR: MH/UNIT	LABOR: TOTAL HRS	LABOR: UNIT PRICE	LABOR: COST	EQUIPMENT: UNIT PRICE	EQUIPMENT: COST	MATERIAL: UNIT PRICE	MATERIAL: COST	TOTAL
New Heat Pump	1	EA	4	4	39.60	158.40			1120	1120.00	1,278.40
									SUBTOTAL		1,278.40
									O/H (15%)		191.76
									Profit (10%)		147.02
									TAX (4%)		64.69
									BOND (1%)		16.82
									TOTAL		1698.69
									SAY	$1700	

DA FORM 5418-R, Apr 85 CONTD

LIFE CYCLE COST ANALYSIS SUMMARY
ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP)

LOCATION: ______ REGION NO. ______ PROJECT NUMBER ______

PROJECT TITLE Replace Broken Heat Pumps FISCAL YEAR ______

DISCRETE PORTION NAME Unit Type 20-IV

ANALYSIS DATE ______ ECONOMIC LIFE 15 YEARS PREPARED BY ______

1. INVESTMENT
   A. CONSTRUCTION COST $ 1700.00
   B. SIOH (5.5%) $ 93.50
   C. DESIGN COST (10%) $ 170.00
   D. ENERGY CREDIT CALC (1A+1B+1C)X.9 $ 1767.15
   E. SALVAGE VALUE - $ —
   F. TOTAL INVESTMENT (1D-1E) $ 1767.15

2. ENERGY SAVINGS (+) / COST (-)
   ANALYSIS DATE ANNUAL SAVINGS, UNIT COST & DISCOUNTED SAVINGS

FUEL	COST $/MBTU/YR(1)	SAVINGS MBTU/YR(2)	ANNUAL $ SAVINGS(3)	DISCOUNT FACTOR(4)	DISCOUNTED SAVINGS(5)
A. ELEC	$ 19.92	40.239/unit	$ 801.72	9.32	$ 7,472.03
B. DIST	$		$		$
C. RESID	$		$		$
D. NG	$		$		$
E. COAL	$		$		$
F. TOTAL			$ 801.72		-----------> $ 7,472.03

3. NONENERGY SAVINGS(+) / COST(-)
   A. ANNUAL RECURRING (+/-) $ 0
      (1) DISCOUNT FACTOR (TABLE A) ______
      (2) DISCOUNTED SAVING/COST (3A X 3A1) $ 0

   B. NONRECURRING SAVINGS(+) / COST(-)

ITEM	SAVINGS(+) COST (-)(1)	YEAR OF OCCURRENCE(2)	DISCOUNT FACTOR(3)	DISCOUNTED SAVINGS(+) COST(-)(4)
(1)	$			$
(2)	$			$
(3)	$			$
(4) TOTAL	$			$

   C. TOTAL NONENERGY DISCOUNTED SAVINGS(+) / COST(-) (3A2+3Bd4) $ ______

   D. PROJECT NONENERGY QUALIFICATION TEST
      (1) 25% MAX NONENERGY CALC (2F5 X .33) $ 2,465.77
         a. IF 3D1 IS = OR > 3C GO TO ITEM 4
         b. IF 3D1 IS < 3C CALC SIR = (2F5+3D1) ÷ 1F = ______
         c. IF 3D1b IS = > 1 GO TO ITEM 4
         d. IF 3D1b IS < 1 PROJECT DOES NOT QUALIFY

4. FIRST YEAR DOLLAR SAVINGS 2F3+3A+(3B1d ÷ YEARS ECONOMIC LIFE) $ 801.72

5. TOTAL NET DISCOUNTED SAVINGS (2F5+3C) $ 7,472.03

6. DISCOUNTED SAVINGS RATIO (IF < 1 PROJECT DOES NOT QUALIFY)(SIR)=(5 ÷ 1F)= 4.23

Cost for Heat Pump Repair = $270.00
(see page 4-60 to 4-60E)

Payback = $\frac{\$270.00}{\$801.72/yr}$ = 0.34 year

SIR = 9.65
(see attached)

Repairing the heat pumps is more cost effective than replacing them.

CEDRIC D. O. CHONG & ASSOCIATES, INC.
CONSULTING MECHANICAL & ELECTRICAL ENGINEERS
130-E North King Street Honolulu, Hawaii 96810
Telephone (808) 847-6557 Telefax: (808) 847-6550

DATE:	JOB No.:
PROJECT NAME:	BY:
SUBJECT:	Sht. 4-24A 01

LIFE CYCLE COST ANALYSIS SUMMARY
ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP)

LOCATION: ______ REGION NO. ______ PROJECT NUMBER ______

PROJECT TITLE Repair Broken Heat Pumps FISCAL YEAR ______

DISCRETE PORTION NAME Unit Type 20-IV

ANALYSIS DATE ______ ECONOMIC LIFE 4 YEARS PREPARED BY ______

1. INVESTMENT
   A. CONSTRUCTION COST $ 270.00
   B. SIOH (5.5%) $ 14.85
   C. DESIGN COST (10%) $ 27.00
   D. ENERGY CREDIT CALC (1A+1B+1C)X.9 $ 280.67
   E. SALVAGE VALUE - $ —
   F. TOTAL INVESTMENT (1D-1E) $ 280.67

2. ENERGY SAVINGS (+) / COST (-)
   ANALYSIS DATE ANNUAL SAVINGS, UNIT COST & DISCOUNTED SAVINGS

FUEL	COST $/MBTU/YR(1)	SAVINGS MBTU/YR(2)	ANNUAL $ SAVINGS(3)	DISCOUNT FACTOR(4)	DISCOUNTED SAVINGS(5)
A. ELEC	$ 19.92	40.239/unit	$ 801.72	3.38	$ 2,709.81
B. DIST	$		$		$
C. RESID	$		$		$
D. NG	$		$		$
E. COAL	$		$		$
F. TOTAL			$ 801.72		----------> $ 2,709.81

3. NONENERGY SAVINGS(+) / COST(-)
   A. ANNUAL RECURRING (+/-) $ 0
      (1) DISCOUNT FACTOR (TABLE A) ______
      (2) DISCOUNTED SAVING/COST (3A X 3A1) $ 0

   B. NONRECURRING SAVINGS(+) / COST(-)

ITEM	SAVINGS(+) COST (-)(1)	YEAR OF OCCURRENCE(2)	DISCOUNT FACTOR(3)	DISCOUNTED SAVINGS(+) COST(-)(4)
(1)	$			$
(2)	$			$
(3)	$			$
(4) TOTAL	$			$

   C. TOTAL NONENERGY DISCOUNTED SAVINGS(+) / COST(-) (3A2+3Bd4) $ ______

   D. PROJECT NONENERGY QUALIFICATION TEST
      (1) 25% MAX NONENERGY CALC (2F5 X .33) $ 894.24
         a. IF 3D1 IS = OR > 3C GO TO ITEM 4
         b. IF 3D1 IS < 3C CALC SIR = (2F5+3D1) ÷ 1F = ______
         c. IF 3D1b IS = > 1 GO TO ITEM 4
         d. IF 3D1b IS < 1 PROJECT DOES NOT QUALIFY

4. FIRST YEAR DOLLAR SAVINGS 2F3+3A+(3B1d ÷ YEARS ECONOMIC LIFE) $ 801.72

5. TOTAL NET DISCOUNTED SAVINGS (2F5+3C) $ 2,709.81

6. DISCOUNTED SAVINGS RATIO (IF < 1 PROJECT DOES NOT QUALIFY)(SIR)=(5 ÷ 1F)= 9.65

d. Unit Type 20-V

Energy use without heat pump:

$$\frac{[(198.4\ gal/day)(1\ BTU/lb\text{-}F)(8.33\ lb/gal)(120-70F)]}{(3413\ BTUH/KW)} = 24.2\ \frac{KWH}{Day}$$

Energy Use with heat pump:

$$\frac{[(198.4\ gal/day)(1\ BTU/lb\text{-}F)(8.33\ lb/gal)(120-70F)]}{(3413\ BTUH/KW)(3.0\ COP)} = 8.1\ \frac{KWH}{day}$$

Daily Energy Savings = 24.2 - 8.1 = 16.1 KWH/Day

ANNUAL ENERGY SAVINGS
= 16.1 KWH/day × (365 day/yr) = 5,877 KWH/yr

ANNUAL COST SAVINGS
= 5,877 KWH/yr × ($ 0.068 /KWH) = $ 399.63

Cost for heat pump replacement = $ 1700
(see attached)

$$\text{Payback} = \frac{\$\ 1,700}{\$\ 399.63\ /yr} = 4.3$$

SIR = 2.11 (see attached)

∴ Replacement of broken heat pump units would be cost effective.

[C]EDRIC D. O. CHONG & ASSOCIATES, INC.
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2130-E North King Street Honolulu, Hawaii 96819
Telephone (808) 847-6557 Telefax: (808) 847-6550

DATE:	JOB No.:
PROJECT NAME:	BY:
SUBJECT:	Sht. Of 4-25

Replace Broken Heat Pumps

TASK DESCRIPTION	QUANTITY		LABOR				EQUIPMENT		MATERIAL		TOTAL
	NO. OF UNITS	UNIT MEAS	MH/UNIT	TOTAL HRS	UNIT PRICE	COST	UNIT PRICE	COST	UNIT PRICE	COST	
New Heat Pump	1	EA	4	4	39.60	158.40			1120	1120.00	1,278.40
									SUBTOTAL		1,278.40
									O/H (15%)		191.76
									Profit (10%)		147.02
									TAX (4%)		64.69
									BOND (1%)		16.82
									TOTAL		1698.69
									SAY	$1700	

ESTIMATOR | CHECKED BY | SHEET OF SHEETS

DA FORM 5418-R, Apr 85 CONTD

LIFE CYCLE COST ANALYSIS SUMMARY
ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP)

LOCATION: ____________ REGION NO. ______ PROJECT NUMBER ______

PROJECT TITLE Replace Broken Heat Pumps FISCAL YEAR ______

DISCRETE PORTION NAME Unit Type 20-V

ANALYSIS DATE ______ ECONOMIC LIFE 15 YEARS PREPARED BY ______

1. INVESTMENT
   - A. CONSTRUCTION COST $ 1700.00
   - B. SIOH (5.5%) $ 93.50
   - C. DESIGN COST (10%) $ 170.00
   - D. ENERGY CREDIT CALC (1A+1B+1C)X.9 $ 1767.15
   - E. SALVAGE VALUE - $ —
   - F. TOTAL INVESTMENT (1D-1E) $ 1767.15

2. ENERGY SAVINGS (+) / COST (-)
   ANALYSIS DATE ANNUAL SAVINGS, UNIT COST & DISCOUNTED SAVINGS

FUEL	COST $/MBTU/YR(1)	SAVINGS MBTU/YR(2)	ANNUAL $ SAVINGS(3)	DISCOUNT FACTOR(4)	DISCOUNTED SAVINGS(5)
A. ELEC	$19.92	20.058/unit	$399.63	9.32	$ 3,724.55
B. DIST	$		$		$
C. RESID	$		$		$
D. NG	$		$		$
E. COAL	$		$		$
F. TOTAL			$ 399.63		----------> $ 3,724.55

3. NONENERGY SAVINGS(+) / COST(-)
   - A. ANNUAL RECURRING (+/-) $ 0
     - (1) DISCOUNT FACTOR (TABLE A) ______
     - (2) DISCOUNTED SAVING/COST (3A X 3A1) $ 0
   - B. NONRECURRING SAVINGS(+) / COST(-)

ITEM	SAVINGS(+) COST (-)(1)	YEAR OF OCCURRENCE(2)	DISCOUNT FACTOR(3)	DISCOUNTED SAVINGS(+) COST(-)(4)
(1)	$			$
(2)	$			$
(3)	$			$
(4) TOTAL	$			$

   - C. TOTAL NONENERGY DISCOUNTED SAVINGS(+) / COST(-) (3A2+3Bd4) $ ______
   - D. PROJECT NONENERGY QUALIFICATION TEST
     - (1) 25% MAX NONENERGY CALC (2F5 X .33) $ 1,229.10
       - a. IF 3D1 IS = OR > 3C GO TO ITEM 4
       - b. IF 3D1 IS < 3C CALC SIR = (2F5+3D1) ÷ 1F = ______
       - c. IF 3D1b IS = > 1 GO TO ITEM 4
       - d. IF 3D1b IS < 1 PROJECT DOES NOT QUALIFY

4. FIRST YEAR DOLLAR SAVINGS 2F3+3A+(3B1d ÷ YEARS ECONOMIC LIFE) $ 399.63

5. TOTAL NET DISCOUNTED SAVINGS (2F5+3C) $ 3,724.55

6. DISCOUNTED SAVINGS RATIO (IF < 1 PROJECT DOES NOT QUALIFY)(SIR)=(5 ÷ 1F)= 2.11

Cost for Heat Pump Repair = $1270.00
(see page 4-60C to 4-60E)

$$\text{Payback} = \frac{\$270.00}{\$399.63} = 0.68 \text{ year}$$

SIR = 4.81
(see attached)

Repairing the heat pumps is more cost effective than replacing them.

CEDRIC D. O. CHONG & ASSOCIATES, INC.
CONSULTING MECHANICAL & ELECTRICAL ENGINEERS
1130-E North King Street Honolulu, Hawaii 96819
Telephone (808) 847-6557 Telefax: (808) 847-6550

DATE: | JOB No.:

PROJECT NAME: | BY:

SUBJECT: | Sht. 4-27A of

LIFE CYCLE COST ANALYSIS SUMMARY
ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP)

LOCATION: ________ REGION NO. ______ PROJECT NUMBER ________

PROJECT TITLE Repair Broken Heat Pumps FISCAL YEAR ________

DISCRETE PORTION NAME Unit Type 20-V

ANALYSIS DATE ________ ECONOMIC LIFE 4 YEARS PREPARED BY ________

1. INVESTMENT
   A. CONSTRUCTION COST $ 270.00
   B. SIOH (5.5%) $ 14.85
   C. DESIGN COST (10%) $ 27.00
   D. ENERGY CREDIT CALC (1A+1B+1C)X.9 $ 280.67
   E. SALVAGE VALUE - $ —
   F. TOTAL INVESTMENT (1D-1E) $ 280.67

2. ENERGY SAVINGS (+) / COST (-)
   ANALYSIS DATE ANNUAL SAVINGS, UNIT COST & DISCOUNTED SAVINGS

FUEL	COST $/MBTU/YR(1)	SAVINGS MBTU/YR(2)	ANNUAL $ SAVINGS(3)	DISCOUNT FACTOR(4)	DISCOUNTED SAVINGS(5)
A. ELEC	$ 19.92	20.058/unit	$ 399.63	3.38	$ 1,350.75
B. DIST	$		$		$
C. RESID	$		$		$
D. NG	$		$		$
E. COAL	$		$		$
F. TOTAL			$ 399.63		--------> $ 1,350.75

3. NONENERGY SAVINGS(+) / COST(-)
   A. ANNUAL RECURRING (+/-) $ 0
      (1) DISCOUNT FACTOR (TABLE A) ____
      (2) DISCOUNTED SAVING/COST (3A X 3A1) $ 0

   B. NONRECURRING SAVINGS(+) / COST(-)

ITEM	SAVINGS(+) COST (-)(1)	YEAR OF OCCURRENCE(2)	DISCOUNT FACTOR(3)	DISCOUNTED SAVINGS(+) COST(-)(4)
(1)	$			$
(2)	$			$
(3)	$			$
(4) TOTAL	$			$

   C. TOTAL NONENERGY DISCOUNTED SAVINGS(+) / COST(-) (3A2+3Bd4) $ ____

   D. PROJECT NONENERGY QUALIFICATION TEST
      (1) 25% MAX NONENERGY CALC (2F5 X .33) $ 445.75
         a. IF 3D1 IS = OR > 3C GO TO ITEM 4
         b. IF 3D1 IS < 3C CALC SIR = (2F5+3D1) ÷ 1F = ____
         c. IF 3D1b IS = > 1 GO TO ITEM 4
         d. IF 3D1b IS < 1 PROJECT DOES NOT QUALIFY

4. FIRST YEAR DOLLAR SAVINGS 2F3+3A+(3B1d ÷ YEARS ECONOMIC LIFE) $ 399.63

5. TOTAL NET DISCOUNTED SAVINGS (2F5+3C) $ 1,350.75

6. DISCOUNTED SAVINGS RATIO (IF < 1 PROJECT DOES NOT QUALIFY)(SIR)=(5 ÷ 1F)= 4.81

e. Unit Type 32-I (& 32-II)

Energy use without heat pump:

$$\frac{[(198.4\ gal/day)(1\ BTU/lb\text{-}F)(8.33\ lb/gal)(120-70F)]}{(3413\ BTUH/KW)} = 24.2\ \frac{KWH}{Day}$$

Energy Use with heat pump:

$$\frac{[(198.4\ gal/day)(1\ BTU/lb\text{-}F)(8.33\ lb/gal)(120-70F)]}{(3413\ BTUH/KW)(3.0\ COP)} = 8.1\ \frac{KWH}{day}$$

Daily Energy Savings = 24.2 - 8.1 = 16.1 KWH/Day

ANNUAL ENERGY SAVINGS
= 16.1 KWH/day x (365 day/yr) = 5,877 KWH/yr

ANNUAL COST SAVINGS
= 5,877 KWH/yr x ($0.068/KWH) = $ 399.63

Cost for heat pump replacement = $ 1,700
(see attached)

$$\text{Payback} = \frac{\$\ 1,700}{\$\ 399.63\ /yr} = 4.25\ yrs$$

SIR = 2.11 (see attached)

∴ Replacement of broken heat pump units would be cost effective.

CEDRIC D. O. CHONG & ASSOCIATES, INC.
CONSULTING MECHANICAL & ELECTRICAL ENGINEERS
2130-E North King Street Honolulu, Hawaii 96819
Telephone (808) 847-6557 Telefax: (808) 847-6550

DATE:	JOB No.:
PROJECT NAME:	BY:
SUBJECT:	Sht. Of 4-28

P Replace Broken Heat Pumps | ESTIMATOR | CHECKED BY | SHEET OF SHEETS

TASK DESCRIPTION	QUANTITY		LABOR				EQUIPMENT		MATERIAL		TOTAL
	NO. OF UNITS	UNIT MEAS	MH/UNIT	TOTAL HRS	UNIT PRICE	COST	UNIT PRICE	COST	UNIT PRICE	COST	
New Heat Pump	1	EA	4	4	39.60	158.40			1120	1120.00	1,278.40
									SUBTOTAL		1,278.40
									O/H	(15%)	191.76
									Profit	(10%)	147.02
									TAX	(4%)	64.69
									BOND	(1%)	16.82
									TOTAL		1698.69
									SAY	$1700	

DA FORM 5418-R, Apr 85 CONTD

LIFE CYCLE COST ANALYSIS SUMMARY
ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP)

LOCATION: ______ REGION NO. ______ PROJECT NUMBER ______

PROJECT TITLE Replace Broken Heat Pumps FISCAL YEAR ______

DISCRETE PORTION NAME Unit Type 32-I & 32-II

ANALYSIS DATE ______ ECONOMIC LIFE 15 YEARS PREPARED BY ______

1. INVESTMENT
   - A. CONSTRUCTION COST $ 1700.00
   - B. SIOH (5.5%) $ 93.50
   - C. DESIGN COST (10%) $ 170.00
   - D. ENERGY CREDIT CALC (1A+1B+1C)X.9 $ 1767.15
   - E. SALVAGE VALUE - $ —
   - F. TOTAL INVESTMENT (1D-1E) $ 1767.15

2. ENERGY SAVINGS (+) / COST (-)
   ANALYSIS DATE ANNUAL SAVINGS, UNIT COST & DISCOUNTED SAVINGS

FUEL	COST $/MBTU/YR(1)	SAVINGS MBTU/YR(2)	ANNUAL $ SAVINGS(3)	DISCOUNT FACTOR(4)	DISCOUNTED SAVINGS(5)
A. ELEC	$ 19.92	20.058/unit	$ 399.63	9.32	$ 3,724.55
B. DIST	$		$		$
C. RESID	$		$		$
D. NG	$		$		$
E. COAL	$		$		$
F. TOTAL			$ 399.63		----------> $ 3,724.55

3. NONENERGY SAVINGS(+) / COST(-)
   - A. ANNUAL RECURRING (+/-) $ ______
     - (1) DISCOUNT FACTOR (TABLE A) ______
     - (2) DISCOUNTED SAVING/COST (3A X 3A1) $ ______
   - B. NONRECURRING SAVINGS(+) / COST(-)

ITEM	SAVINGS(+) COST (-)(1)	YEAR OF OCCURRENCE(2)	DISCOUNT FACTOR(3)	DISCOUNTED SAVINGS(+) COST(-)(4)
(1)	$			$
(2)	$			$
(3)	$			$
(4) TOTAL	$			$

   - C. TOTAL NONENERGY DISCOUNTED SAVINGS(+) / COST(-) (3A2+3Bd4) $ ______
   - D. PROJECT NONENERGY QUALIFICATION TEST
     - (1) 25% MAX NONENERGY CALC (2F5 X .33) $ 1,229.10
       - a. IF 3D1 IS = OR > 3C GO TO ITEM 4
       - b. IF 3D1 IS < 3C CALC SIR = (2F5+3D1) ÷ 1F = ______
       - c. IF 3D1b IS = > 1 GO TO ITEM 4
       - d. IF 3D1b IS < 1 PROJECT DOES NOT QUALIFY

4. FIRST YEAR DOLLAR SAVINGS 2F3+3A+(3B1d ÷ YEARS ECONOMIC LIFE) $ 399.63

5. TOTAL NET DISCOUNTED SAVINGS (2F5+3C) $ 3,724.55

6. DISCOUNTED SAVINGS RATIO (IF < 1 PROJECT DOES NOT QUALIFY)(SIR)=(5 ÷ 1F)= 2.11

Cost for Heat Pump Repair = $270.00
(see page 4-60 C to 4-60E)

Payback = $\frac{\$270.00}{\$399.63}$ = 0.68 year

SIR = 4.81
(see attached

Repairing the heat pumps is more cost effective than replacing them.

CEDRIC D. O. CHONG & ASSOCIATES, INC.
CONSULTING MECHANICAL & ELECTRICAL ENGINEERS
1130-E North King Street Honolulu, Hawaii 96819
Telephone (808) 847-6557 Telefax: (808) 847-6550

DATE: | JOB No.:

PROJECT NAME: | BY:

SUBJECT: | Sht. 4-30A
01

LIFE CYCLE COST ANALYSIS SUMMARY
ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP)

LOCATION: ______ REGION NO. ______ PROJECT NUMBER ______

PROJECT TITLE Repair Broken Heat Pumps FISCAL YEAR ______

DISCRETE PORTION NAME Unit Type 32-I & 32-II

ANALYSIS DATE ______ ECONOMIC LIFE 4 YEARS PREPARED BY ______

1. INVESTMENT
   A. CONSTRUCTION COST $ 270.00
   B. SIOH (5.5%) $ 14.85
   C. DESIGN COST (10%) $ 27.00
   D. ENERGY CREDIT CALC (1A+1B+1C)X.9 $ 280.67
   E. SALVAGE VALUE - $ —
   F. TOTAL INVESTMENT (1D-1E) $ 280.67

2. ENERGY SAVINGS (+) / COST (-)
   ANALYSIS DATE ANNUAL SAVINGS, UNIT COST & DISCOUNTED SAVINGS

FUEL	COST $/MBTU/YR(1)	SAVINGS MBTU/YR(2)	ANNUAL $ SAVINGS(3)	DISCOUNT FACTOR(4)	DISCOUNTED SAVINGS(5)
A. ELEC	$ 19.92	20.058/unit	$ 399.63	3.38	$ 1,350.75
B. DIST	$		$		$
C. RESID	$		$		$
D. NG	$		$		$
E. COAL	$		$		$
F. TOTAL			$ 399.63		----------> $ 1,350.75

3. NONENERGY SAVINGS(+) / COST(-)
   A. ANNUAL RECURRING (+/-) $ 0
      (1) DISCOUNT FACTOR (TABLE A) ______
      (2) DISCOUNTED SAVING/COST (3A X 3A1) $ 0

   B. NONRECURRING SAVINGS(+) / COST(-)

ITEM	SAVINGS(+) COST (-)(1)	YEAR OF OCCURRENCE(2)	DISCOUNT FACTOR(3)	DISCOUNTED SAVINGS(+) COST(-)(4)
(1)	$			$
(2)	$			$
(3)	$			$
(4) TOTAL	$			$

   C. TOTAL NONENERGY DISCOUNTED SAVINGS(+) / COST(-) (3A2+3Bd4) $ ______

   D. PROJECT NONENERGY QUALIFICATION TEST
      (1) 25% MAX NONENERGY CALC (2F5 X .33) $ 445.75
         a. IF 3D1 IS = OR > 3C GO TO ITEM 4
         b. IF 3D1 IS < 3C CALC SIR = (2F5+3D1) ÷ 1F = ______
         c. IF 3D1b IS = > 1 GO TO ITEM 4
         d. IF 3D1b IS < 1 PROJECT DOES NOT QUALIFY

4. FIRST YEAR DOLLAR SAVINGS 2F3+3A+(3B1d ÷ YEARS ECONOMIC LIFE) $ 399.63

5. TOTAL NET DISCOUNTED SAVINGS (2F5+3C) $ 1,350.75

6. DISCOUNTED SAVINGS RATIO (IF < 1 PROJECT DOES NOT QUALIFY)(SIR)=(5 ÷ 1F)= 4.81

f. Unit Type 32-III

Energy use without heat pump:

$$\frac{[(198.4\ gal/day)(1\ BTU/lb\text{-}F)(8.33\ lb/gal)(120-70F)]}{(3413\ BTUH/KW)} = 24.2\ \frac{KWH}{Day}$$

Energy Use with heat pump:

$$\frac{[(198.4\ gal/day)(1\ BTU/lb\text{-}F)(8.33\ lb/gal)(120-70F)]}{(3413\ BTUH/KW)(3.0\ COP)} = 8.1\ \frac{KWH}{day}$$

Daily Energy Savings = 24.2 - 8.1 = 16.1 KWH/Day

ANNUAL ENERGY SAVINGS
= 16.1 KWH/day × (365 day/yr) = 5,877 KWH/yr

ANNUAL COST SAVINGS
= 5,877 KWH/yr × ($0.068 /KWH) = $ 399.63

Cost for heat pump replacement = $ 1700
(see attached)

$$\text{Payback} = \frac{\$\ 1700}{\$\ 399.63\ /yr} = 4.25\ yrs$$

SIR = 2.11 (see attached)

∴ Replacement of broken heat pump units would be cost effective.

CEDRIC D. O. CHONG & ASSOCIATES, INC.
CONSULTING MECHANICAL & ELECTRICAL ENGINEERS
2130-E North King Street Honolulu, Hawaii 96819
Telephone (808) 847-6557 Telefax: (808) 847-6550

DATE:	JOB No.:
PROJECT NAME:	BY:
SUBJECT:	Sht. 4-31 Of

Replace Broken Heat Pumps

TASK DESCRIPTION	QUANTITY: NO. OF UNITS	QUANTITY: UNIT MEAS	LABOR: MH/UNIT	LABOR: TOTAL HRS	LABOR: UNIT PRICE	LABOR: COST	EQUIPMENT: UNIT PRICE	EQUIPMENT: COST	MATERIAL: UNIT PRICE	MATERIAL: COST	TOTAL
New Heat Pump	1	EA	4	4	39.60	158.40			1120	1120.00	1,278.40
									SUBTOTAL		1,278.40
									O/H	(15%)	191.76
									Profit	(10%)	147.02
									TAX	(4%)	64.69
									BOND	(1%)	16.82
									TOTAL		1698.69
									SAY	$1700	

ESTIMATOR | CHECKED BY | SHEET OF SHEETS

DA FORM 5418-R, Apr 85 CONTD

LIFE CYCLE COST ANALYSIS SUMMARY
ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP)

LOCATION: ______ REGION NO. ______ PROJECT NUMBER ______

PROJECT TITLE Replace Broken Heat Pumps FISCAL YEAR ______

DISCRETE PORTION NAME Unit Type 32-III

ANALYSIS DATE ______ ECONOMIC LIFE 15 YEARS PREPARED BY ______

1. INVESTMENT
   A. CONSTRUCTION COST $ 1700.00
   B. SIOH (5.5%) $ 93.50
   C. DESIGN COST (10%) $ 170.00
   D. ENERGY CREDIT CALC (1A+1B+1C)X.9 $ 1767.15
   E. SALVAGE VALUE - $ —
   F. TOTAL INVESTMENT (1D-1E) $ 1767.15

2. ENERGY SAVINGS (+) / COST (-)
   ANALYSIS DATE ANNUAL SAVINGS, UNIT COST & DISCOUNTED SAVINGS

FUEL	COST $/MBTU/YR(1)	SAVINGS MBTU/YR(2)	ANNUAL $ SAVINGS(3)	DISCOUNT FACTOR(4)	DISCOUNTED SAVINGS(5)
A. ELEC	$19.92	20.058/unit	$399.63	9.32	$3,724.55
B. DIST	$		$		$
C. RESID	$		$		$
D. NG	$		$		$
E. COAL	$		$		$
F. TOTAL			$399.63		----------> $3,724.55

3. NONENERGY SAVINGS(+) / COST(-)
   A. ANNUAL RECURRING (+/-) $ 0
      (1) DISCOUNT FACTOR (TABLE A) ______
      (2) DISCOUNTED SAVING/COST (3A X 3A1) $ 0

   B. NONRECURRING SAVINGS(+) / COST(-)

ITEM	SAVINGS(+) COST (-)(1)	YEAR OF OCCURRENCE(2)	DISCOUNT FACTOR(3)	DISCOUNTED SAVINGS(+) COST(-)(4)
(1)	$			$
(2)	$			$
(3)	$			$
(4) TOTAL	$			$

   C. TOTAL NONENERGY DISCOUNTED SAVINGS(+) / COST(-) (3A2+3Bd4) $ ______

   D. PROJECT NONENERGY QUALIFICATION TEST
      (1) 25% MAX NONENERGY CALC (2F5 X .33) $ 1,229.10
         a. IF 3D1 IS = OR > 3C GO TO ITEM 4
         b. IF 3D1 IS < 3C CALC SIR = (2F5+3D1) ÷ 1F = ______
         c. IF 3D1b IS = > 1 GO TO ITEM 4
         d. IF 3D1b IS < 1 PROJECT DOES NOT QUALIFY

4. FIRST YEAR DOLLAR SAVINGS 2F3+3A+(3B1d ÷ YEARS ECONOMIC LIFE) $ 399.63

5. TOTAL NET DISCOUNTED SAVINGS (2F5+3C) $ 3,724.55

6. DISCOUNTED SAVINGS RATIO (IF < 1 PROJECT DOES NOT QUALIFY)(SIR)=(5 ÷ 1F)= 2.11

Cost for Heat Pump Repair = $270.00
(see page 4-60 C to 4-60E)

$$\text{Payback} = \frac{\$270.00}{\$399.63} = 0.68 \text{ year}$$

SIR = 4.81
(see attached

Repairing the heat pumps is more cost effective than replacing them.

CEDRIC D. O. CHONG & ASSOCIATES, INC.
CONSULTING MECHANICAL & ELECTRICAL ENGINEERS
1130-E North King Street Honolulu, Hawaii 96819
Telephone (808) 847-6557 Telefax: (808) 847-8550

DATE:	JOB No.:
PROJECT NAME:	BY:
SUBJECT:	Sht. 4-33A 01

LIFE CYCLE COST ANALYSIS SUMMARY
ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP)

LOCATION: ______ REGION NO. ______ PROJECT NUMBER ______

PROJECT TITLE Repair Broken Heat Pumps FISCAL YEAR ______

DISCRETE PORTION NAME Unit Type 32 - III

ANALYSIS DATE ______ ECONOMIC LIFE 4 YEARS PREPARED BY ______

1. INVESTMENT
   A. CONSTRUCTION COST $ 270.00
   B. SIOH (5.5%) $ 14.85
   C. DESIGN COST (10%) $ 27.00
   D. ENERGY CREDIT CALC (1A+1B+1C)X.9 $ 280.67
   E. SALVAGE VALUE - $ —
   F. TOTAL INVESTMENT (1D-1E) $ 280.67

2. ENERGY SAVINGS (+) / COST (-)
   ANALYSIS DATE ANNUAL SAVINGS, UNIT COST & DISCOUNTED SAVINGS

FUEL	COST $/MBTU/YR(1)	SAVINGS MBTU/YR(2)	ANNUAL $ SAVINGS(3)	DISCOUNT FACTOR(4)	DISCOUNTED SAVINGS(5)
A. ELEC	$ 19.92	20.058/unit	$ 399.63	3.38	$ 1350.75
B. DIST	$		$		$
C. RESID	$		$		$
D. NG	$		$		$
E. COAL	$		$		$
F. TOTAL			$ 399.63		----------> $ 1,350.75

3. NONENERGY SAVINGS(+) / COST(-)
   A. ANNUAL RECURRING (+/-) $ 0
      (1) DISCOUNT FACTOR (TABLE A) ______
      (2) DISCOUNTED SAVING/COST (3A X 3A1) $ 0

   B. NONRECURRING SAVINGS(+) / COST(-)

ITEM	SAVINGS(+) COST (-)(1)	YEAR OF OCCURRENCE(2)	DISCOUNT FACTOR(3)	DISCOUNTED SAVINGS(+) COST(-)(4)
(1)	$			$
(2)	$			$
(3)	$			$
(4) TOTAL	$			$

   C. TOTAL NONENERGY DISCOUNTED SAVINGS(+) / COST(-) (3A2+3Bd4) $ ______

   D. PROJECT NONENERGY QUALIFICATION TEST
      (1) 25% MAX NONENERGY CALC (2F5 X .33) $ 445.75
         a. IF 3D1 IS = OR > 3C GO TO ITEM 4
         b. IF 3D1 IS < 3C CALC SIR = (2F5+3D1) ÷ 1F = ______
         c. IF 3D1b IS = > 1 GO TO ITEM 4
         d. IF 3D1b IS < 1 PROJECT DOES NOT QUALIFY

4. FIRST YEAR DOLLAR SAVINGS 2F3+3A+(3B1d ÷ YEARS ECONOMIC LIFE) $ 399.63

5. TOTAL NET DISCOUNTED SAVINGS (2F5+3C) $ 1,350.75

6. DISCOUNTED SAVINGS RATIO (IF < 1 PROJECT DOES NOT QUALIFY)(SIR)=(5 ÷ 1F)= 4.81

g. Unit Type 32-IV

Energy use without heat pump:

$$\frac{[(330.7 \text{ gal/day})(1 \text{ BTU/lb-F})(8.33 \text{ lb/gal})(120-70F)]}{(3413 \text{ BTUH/KW})} = 40.4 \frac{\text{KWH}}{\text{Day}}$$

Energy Use with heat pump:

$$\frac{[(330.7 \text{ gal/day})(1 \text{ BTU/lb-F})(8.33 \text{ lb/gal})(120-70F)]}{(3413 \text{ BTUH/kw})(3.0 \text{ COP})} = 13.5 \frac{\text{KWH}}{\text{day}}$$

Daily Energy Savings = 40.4 − 13.5 = 26.9 KWH/Day

ANNUAL ENERGY SAVINGS
= 26.9 KWH/day × (365 day/yr) = 9,819 KWH/yr

ANNUAL COST SAVINGS
= 9,819 KWH/yr × ($0.068 /KWH) = $ 667.69

Cost for heat pump replacement = $ 1700
(see attached)

$$\text{Payback} = \frac{\$\ 1{,}700}{\$\ 667.69\ /yr} = 2.55 \text{ yrs}$$

SIR = 3.52 (see attached)

∴ Replacement of broken heat pump units would be cost effective.

EDRIC D. O. CHONG & ASSOCIATES, INC.
CONSULTING MECHANICAL & ELECTRICAL ENGINEERS
2130-E North King Street Honolulu, Hawaii 96819
Telephone (808) 847-6557 Telefax: (808) 847-6550

DATE:	JOB No.:
PROJECT NAME:	BY:
SUBJECT:	Sht. Of 4-34

P[illegible] Replace Broken Heat Pumps | ESTIMATOR | CHECKED BY | SHEET OF [illegible]EETS

TASK DESCRIPTION	QUANTITY: NO. OF UNITS	QUANTITY: UNIT MEAS	LABOR: MH/UNIT	LABOR: TOTAL HRS	LABOR: UNIT PRICE	LABOR: COST	EQUIPMENT: UNIT PRICE	EQUIPMENT: COST	MATERIAL: UNIT PRICE	MATERIAL: COST	TOTAL
New Heat Pump	1	EA	4	4	39.60	158.40			1120	1120.00	1,278.40
									SUBTOTAL		1,278.40
									O/H	(15%)	191.76
									Profit	(10%)	147.02
									TAX	(4%)	64.69
									BOND	(1%)	16.82
									TOTAL		1698.69
									SAY	$1700	

DA FORM 541B-R, Apr 85 CONTD

LIFE CYCLE COST ANALYSIS SUMMARY
ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP)

LOCATION: ______ REGION NO. ______ PROJECT NUMBER ______

PROJECT TITLE Replace Broken Heat Pumps FISCAL YEAR ______

DISCRETE PORTION NAME Unit Type 32 - IV

ANALYSIS DATE ______ ECONOMIC LIFE 15 YEARS PREPARED BY ______

1. INVESTMENT
   - A. CONSTRUCTION COST — $ 1700.00
   - B. SIOH (5.5%) — $ 93.50
   - C. DESIGN COST (10%) — $ 170.00
   - D. ENERGY CREDIT CALC (1A+1B+1C)X.9 — $ 1767.15
   - E. SALVAGE VALUE — - $ —
   - F. TOTAL INVESTMENT (1D-1E) — $ 1767.15

2. ENERGY SAVINGS (+) / COST (-)
   ANALYSIS DATE ANNUAL SAVINGS, UNIT COST & DISCOUNTED SAVINGS

FUEL	COST $/MBTU/YR(1)	SAVINGS MBTU/YR(2)	ANNUAL $ SAVINGS(3)	DISCOUNT FACTOR(4)	DISCOUNTED SAVINGS(5)
A. ELEC	$ 19.92	33.512/unit	$ 667.69	9.32	$ 6,222.87
B. DIST	$		$		$
C. RESID	$		$		$
D. NG	$		$		$
E. COAL	$		$		$
F. TOTAL			$ 667.69		----------> $ 6,222.87

3. NONENERGY SAVINGS(+) / COST(-)
   - A. ANNUAL RECURRING (+/-) — $ 0
     - (1) DISCOUNT FACTOR (TABLE A) ______
     - (2) DISCOUNTED SAVING/COST (3A X 3A1) — $ 0
   - B. NONRECURRING SAVINGS(+) / COST(-)

ITEM	SAVINGS(+) COST (-)(1)	YEAR OF OCCURRENCE(2)	DISCOUNT FACTOR(3)	DISCOUNTED SAVINGS(+) COST(-)(4)
(1)	$			$
(2)	$			$
(3)	$			$
(4) TOTAL	$			$

   - C. TOTAL NONENERGY DISCOUNTED SAVINGS(+) / COST(-) (3A2+3Bd4) $ ______
   - D. PROJECT NONENERGY QUALIFICATION TEST
     - (1) 25% MAX NONENERGY CALC (2F5 X .33) — $ 2,053.55
       - a. IF 3D1 IS = OR > 3C GO TO ITEM 4
       - b. IF 3D1 IS < 3C CALC SIR = (2F5+3D1) ÷ 1F = ______
       - c. IF 3D1b IS = > 1 GO TO ITEM 4
       - d. IF 3D1b IS < 1 PROJECT DOES NOT QUALIFY

4. FIRST YEAR DOLLAR SAVINGS 2F3+3A+(3B1d ÷ YEARS ECONOMIC LIFE) — $ 667.69
5. TOTAL NET DISCOUNTED SAVINGS (2F5+3C) — $ 6,222.87
6. DISCOUNTED SAVINGS RATIO (IF < 1 PROJECT DOES NOT QUALIFY)(SIR)=(5 ÷ 1F)= 3.52

Cost for Heat Pump Repair = $1270.00
(see page 4-60 C to 4-60E)

Payback = $\frac{\$270.00}{\$667.69}$ = 0.40 year

SIR = 8.04
(see attached

Repairing the heat pumps is more cost effective than replacing them.

CEDRIC D. O. CHONG & ASSOCIATES, INC.
CONSULTING MECHANICAL & ELECTRICAL ENGINEERS
1130-E North King Street Honolulu, Hawaii 96810
Telephone (808) 847-6557 Telefax: (808) 847-6550

DATE: JOB No.:

PROJECT NAME: BY:

SUBJECT: Sht. 4-36A 01

LIFE CYCLE COST ANALYSIS SUMMARY
ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP)

LOCATION: ______ REGION NO. ______ PROJECT NUMBER ______

PROJECT TITLE Repair Broken Heat Pumps FISCAL YEAR ______

DISCRETE PORTION NAME Unit Type 32-IV

ANALYSIS DATE ______ ECONOMIC LIFE 4 YEARS PREPARED BY ______

1. INVESTMENT
   A. CONSTRUCTION COST $ 270.00
   B. SIOH (5.5%) $ 14.85
   C. DESIGN COST (10%) $ 27.00
   D. ENERGY CREDIT CALC (1A+1B+1C)X.9 $ 280.67
   E. SALVAGE VALUE - $ —
   F. TOTAL INVESTMENT (1D-1E) $ 280.67

2. ENERGY SAVINGS (+) / COST (-)
   ANALYSIS DATE ANNUAL SAVINGS, UNIT COST & DISCOUNTED SAVINGS

FUEL	COST $/MBTU/YR(1)	SAVINGS MBTU/YR(2)	ANNUAL $ SAVINGS(3)	DISCOUNT FACTOR(4)	DISCOUNTED SAVINGS(5)
A. ELEC	$19.92	33.5/2/unit	$ 667.69	3.38	$ 2,256.79
B. DIST	$		$		$
C. RESID	$		$		$
D. NG	$		$		$
E. COAL	$		$		$
F. TOTAL			$ 667.69	--------->	$ 2,256.79

3. NONENERGY SAVINGS(+) / COST(-)
   A. ANNUAL RECURRING (+/-) $ 0
      (1) DISCOUNT FACTOR (TABLE A) ______
      (2) DISCOUNTED SAVING/COST (3A X 3A1) $ 0

   B. NONRECURRING SAVINGS(+) / COST(-)

ITEM	SAVINGS(+) COST (-)(1)	YEAR OF OCCURRENCE(2)	DISCOUNT FACTOR(3)	DISCOUNTED SAVINGS(+) COST(-)(4)
(1)	$			$
(2)	$			$
(3)	$			$
(4) TOTAL	$			$

   C. TOTAL NONENERGY DISCOUNTED SAVINGS(+) / COST(-) (3A2+3Bd4) $ ______

   D. PROJECT NONENERGY QUALIFICATION TEST
      (1) 25% MAX NONENERGY CALC (2F5 X .33) $ 744.74
         a. IF 3D1 IS = OR > 3C GO TO ITEM 4
         b. IF 3D1 IS < 3C CALC SIR = (2F5+3D1) ÷ 1F = ______
         c. IF 3D1b IS = > 1 GO TO ITEM 4
         d. IF 3D1b IS < 1 PROJECT DOES NOT QUALIFY

4. FIRST YEAR DOLLAR SAVINGS 2F3+3A+(3B1d ÷ YEARS ECONOMIC LIFE) $ 667.69

5. TOTAL NET DISCOUNTED SAVINGS (2F5+3C) $ 2,256.79

6. DISCOUNTED SAVINGS RATIO (IF < 1 PROJECT DOES NOT QUALIFY)(SIR)=(5 ÷ 1F)= 8.04

h. Unit Type 57-I

Energy use without heat pump:

$$\frac{\left[(132.3\ \text{gal/day})(1\ \text{BTU/lb-F})(8.33\ \text{lb/gal})(120-70\text{F})\right]}{(3413\ \text{BTUH/KW})} = 16.1\ \frac{\text{KWH}}{\text{Day}}$$

Energy Use with heat pump:

$$\frac{\left[(132.3\ \text{gal/day})(1\ \text{BTU/lb-F})(8.33\ \text{lb/gal})(120-70\text{F})\right]}{(3413\ \text{BTUH/KW})(3.0\ \text{COP})} = 5.4\ \frac{\text{KWH}}{\text{day}}$$

Daily Energy Savings = 16.1 - 5.4 = 10.7 KWH/Day

ANNUAL ENERGY SAVINGS
= 10.7 KWH/day × (365 day/yr) = 3,906 KWH/yr.

ANNUAL COST SAVINGS
= 3,906 KWH/yr × ($ 0.068 /KWH) = $ 265.61

Cost for heat pump replacement = $ 1,700
(see attached)

$$\text{Payback} = \frac{\$\ 1{,}700}{\$\ 265.61\ /\text{yr}} = 6.4\ \text{yrs}$$

SIR = 1.40 (see attached)

∴ Replacement of broken heat pump units would be cost effective.

CEDRIC D. O. CHONG & ASSOCIATES, INC.
CONSULTING MECHANICAL & ELECTRICAL ENGINEERS
2130-E North King Street Honolulu, Hawaii 96819
Telephone (808) 847-6557 Telefax: (808) 847-6550

DATE: | JOB No.:
PROJECT NAME: | BY:
SUBJECT: | Sht. Of 4-37

PI Replace Broken Heat Pumps | ESTIMATOR | CHECKED BY | SHEET OF | SHEETS

TASK DESCRIPTION	QUANTITY		LABOR				EQUIPMENT		MATERIAL		TOTAL
	NO. OF UNITS	UNIT MEAS	MH/UNIT	TOTAL HRS	UNIT PRICE	COST	UNIT PRICE	COST	UNIT PRICE	COST	
New Heat Pump	1	EA	4	4	39.60	158.40			1120	1120.00	1,278.40
									SUBTOTAL		1,278.40
									O/H (15%)		191.76
									Profit (10%)		147.02
									TAX (4%)		64.69
									BOND (1%)		16.82
									TOTAL		1698.69
									SAY	$1700	

DA FORM 5418-R, Apr 85 CONTD

LIFE CYCLE COST ANALYSIS SUMMARY
ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP)

LOCATION: ______ REGION NO. ______ PROJECT NUMBER ______

PROJECT TITLE Replace Broken Heat Pumps FISCAL YEAR ______

DISCRETE PORTION NAME Unit Type 57-I

ANALYSIS DATE ______ ECONOMIC LIFE 15 YEARS PREPARED BY ______

1. INVESTMENT
   A. CONSTRUCTION COST $ 1700.00
   B. SIOH (5.5%) $ 93.50
   C. DESIGN COST (10%) $ 170.00
   D. ENERGY CREDIT CALC (1A+1B+1C)X.9 $ 1767.15
   E. SALVAGE VALUE - $ —
   F. TOTAL INVESTMENT (1D-1E) $ 1767.15

2. ENERGY SAVINGS (+) / COST (-)
   ANALYSIS DATE ANNUAL SAVINGS, UNIT COST & DISCOUNTED SAVINGS

FUEL	COST $/MBTU/YR(1)	SAVINGS MBTU/YR(2)	ANNUAL $ SAVINGS(3)	DISCOUNT FACTOR(4)	DISCOUNTED SAVINGS(5)
A. ELEC	$ 19.92	13.331/unit	$265.61	9.32	$ 2,475.49
B. DIST	$		$		$
C. RESID	$		$		$
D. NG	$		$		$
E. COAL	$		$		$
F. TOTAL			$265.61		----------> $2,475.49

3. NONENERGY SAVINGS(+) / COST(-)
   A. ANNUAL RECURRING (+/-) $ 0
      (1) DISCOUNT FACTOR (TABLE A) ______
      (2) DISCOUNTED SAVING/COST (3A X 3A1) $ 0

   B. NONRECURRING SAVINGS(+) / COST(-)

ITEM	SAVINGS(+) COST (-)(1)	YEAR OF OCCURRENCE(2)	DISCOUNT FACTOR(3)	DISCOUNTED SAVINGS(+) COST(-)(4)
(1)	$			$
(2)	$			$
(3)	$			$
(4) TOTAL	$			$

   C. TOTAL NONENERGY DISCOUNTED SAVINGS(+) / COST(-) (3A2+3Bd4) $ ______

   D. PROJECT NONENERGY QUALIFICATION TEST
      (1) 25% MAX NONENERGY CALC (2F5 X .33) $ 816.91
         a. IF 3D1 IS = OR > 3C GO TO ITEM 4
         b. IF 3D1 IS < 3C CALC SIR = (2F5+3D1) ÷ 1F = ______
         c. IF 3D1b IS = > 1 GO TO ITEM 4
         d. IF 3D1b IS < 1 PROJECT DOES NOT QUALIFY

4. FIRST YEAR DOLLAR SAVINGS 2F3+3A+(3B1d ÷ YEARS ECONOMIC LIFE) $ 265.61

5. TOTAL NET DISCOUNTED SAVINGS (2F5+3C) $2,475.49

6. DISCOUNTED SAVINGS RATIO (IF < 1 PROJECT DOES NOT QUALIFY)(SIR)=(5 ÷ 1F)= 1.40

Cost for Heat Pump Repair = $270.00
(see page 4-60 to 4-60E)

Payback = $\frac{\$270.00}{\$265.61}$ = 1.0 year

SIR = 3.20
(see attached

Repairing the heat pumps is more cost effective than replacing them.

CEDRIC D. O. CHONG & ASSOCIATES, INC.
CONSULTING MECHANICAL & ELECTRICAL ENGINEERS
2130-E North King Street Honolulu, Hawaii 96819
Telephone (808) 847-6557 Telefax: (808) 847-6550

DATE:	JOB No.:
PROJECT NAME:	BY:
SUBJECT:	Sht. 4-39A 01

LIFE CYCLE COST ANALYSIS SUMMARY
ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP)

LOCATION: ____________ REGION NO. ______ PROJECT NUMBER ______

PROJECT TITLE Repair Broken Heat Pumps FISCAL YEAR ______

DISCRETE PORTION NAME Unit Type 57-I

ANALYSIS DATE ______ ECONOMIC LIFE 4 YEARS PREPARED BY ______

1. INVESTMENT
   A. CONSTRUCTION COST $ 270.00
   B. SIOH (5.5%) $ 14.85
   C. DESIGN COST (10%) $ 27.00
   D. ENERGY CREDIT CALC (1A+1B+1C)X.9 $ 280.67
   E. SALVAGE VALUE - $ —
   F. TOTAL INVESTMENT (1D-1E) $ 280.67

2. ENERGY SAVINGS (+) / COST (-)
   ANALYSIS DATE ANNUAL SAVINGS, UNIT COST & DISCOUNTED SAVINGS

FUEL	COST $/MBTU/YR(1)	SAVINGS MBTU/YR(2)	ANNUAL $ SAVINGS(3)	DISCOUNT FACTOR(4)	DISCOUNTED SAVINGS(5)
A. ELEC	$ 19.92	13.331/unit	$ 265.61	3.38	$ 897.76
B. DIST	$		$		$
C. RESID	$		$		$
D. NG	$		$		$
E. COAL	$		$		$
F. TOTAL			$ 265.61	---------->	$ 897.76

3. NONENERGY SAVINGS(+) / COST(-)
   A. ANNUAL RECURRING (+/-) $ 0
      (1) DISCOUNT FACTOR (TABLE A) ______
      (2) DISCOUNTED SAVING/COST (3A X 3A1) $ 0

   B. NONRECURRING SAVINGS(+) / COST(-)

ITEM	SAVINGS(+) COST (-)(1)	YEAR OF OCCURRENCE(2)	DISCOUNT FACTOR(3)	DISCOUNTED SAVINGS(+) COST(-)(4)
(1)	$			$
(2)	$			$
(3)	$			$
(4) TOTAL	$			$

   C. TOTAL NONENERGY DISCOUNTED SAVINGS(+) / COST(-) (3A2+3Bd4) $ ______

   D. PROJECT NONENERGY QUALIFICATION TEST
      (1) 25% MAX NONENERGY CALC (2F5 X .33) $ 296.26
         a. IF 3D1 IS = OR > 3C GO TO ITEM 4
         b. IF 3D1 IS < 3C CALC SIR = (2F5+3D1) ÷ 1F = ______
         c. IF 3D1b IS = > 1 GO TO ITEM 4
         d. IF 3D1b IS < 1 PROJECT DOES NOT QUALIFY

4. FIRST YEAR DOLLAR SAVINGS 2F3+3A+(3B1d ÷ YEARS ECONOMIC LIFE) $ 265.61

5. TOTAL NET DISCOUNTED SAVINGS (2F5+3C) $ 897.76

6. DISCOUNTED SAVINGS RATIO (IF < 1 PROJECT DOES NOT QUALIFY)(SIR)=(5 ÷ 1F)= 3.20

4-39B

i. Unit Type 57-II (9 57-IV, 57-VI, 57-VIII, 57-IX)

Energy use without heat pump:

$$\frac{\left[(264.6\ gal/day)(1\ BTU/lb\text{-}F)(8.33\ lb/gal)(120-70F)\right]}{(3413\ BTUH/KW)} = 32.3\ \frac{KWH}{Day}$$

Energy Use with heat pump:

$$\frac{\left[(264.6\ gal/day)(1\ BTU/lb\text{-}F)(8.33\ lb/gal)(120-70F)\right]}{(3413\ BTUH/KW)(3.0\ COP)} = 10.8\ \frac{KWH}{day}$$

Daily Energy Savings = 32.3 - 10.8 = 21.5 KWH/Day

ANNUAL ENERGY SAVINGS
= 21.5 KWH/day × (365 day/yr) = 7,848 KWH/yr

ANNUAL COST SAVINGS
= 7,848 KWH/yr × ($0.068 /KWH) = $ 533.63

Cost for heat pump replacement = $ 1,700
(see attached)

$$\text{Payback} = \frac{\$\ 1,700}{\$\ 533.63\ /yr} = 3.2\ yrs$$

SIR = 2.81 (see attached)

∴ Replacement of broken heat pump units would be cost effective.

EDRIC D. O. CHONG & ASSOCIATES, INC.
CONSULTING MECHANICAL & ELECTRICAL ENGINEERS
2130-E North King Street Honolulu, Hawaii 96819
Telephone (808) 847-6557 Telefax: (808) 847-6550

DATE: JOB No.:
PROJECT NAME: BY:
SUBJECT:

PI Replace Broken Heat Pumps | ESTIMATOR | CHECKED BY | SHEET OF SHEETS

TASK DESCRIPTION	QUANTITY		LABOR				EQUIPMENT		MATERIAL		TOTAL
	NO. OF UNITS	UNIT MEAS	MH/UNIT	TOTAL HRS	UNIT PRICE	COST	UNIT PRICE	COST	UNIT PRICE	COST	
New Heat Pump	1	EA	4	4	39.60	158.40			1120	1120.00	1,278.40
									SUBTOTAL		1,278.40
									O/H (15%)		191.76
									Profit (10%)		147.02
									TAX (4%)		64.69
									BOND (1%)		16.82
									TOTAL		1698.69
									SAY	$1700	

DA FORM 5418-R, Apr 85 CONTD

LIFE CYCLE COST ANALYSIS SUMMARY
ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP)

LOCATION: ______________ REGION NO. ______ PROJECT NUMBER ______

PROJECT TITLE Replace Broken Heat Pumps FISCAL YEAR ______

DISCRETE PORTION NAME Unit Type 57-II, IV, VI, VII, VIII & IX

ANALYSIS DATE ______ ECONOMIC LIFE 15 YEARS PREPARED BY ______

1. INVESTMENT
   A. CONSTRUCTION COST $ 1700.00
   B. SIOH (5.5%) $ 93.50
   C. DESIGN COST (10%) $ 170.00
   D. ENERGY CREDIT CALC (1A+1B+1C)X.9 $ 1767.15
   E. SALVAGE VALUE - $ —
   F. TOTAL INVESTMENT (1D-1E) $ 1767.15

2. ENERGY SAVINGS (+) / COST (-)
   ANALYSIS DATE ANNUAL SAVINGS, UNIT COST & DISCOUNTED SAVINGS

FUEL	COST $/MBTU/YR(1)	SAVINGS MBTU/YR(2)	ANNUAL $ SAVINGS(3)	DISCOUNT FACTOR(4)	DISCOUNTED SAVINGS(5)
A. ELEC	$19.92	26.785/unit	$ 533.63	9.32	$ 4,973.43
B. DIST	$		$		$
C. RESID	$		$		$
D. NG	$		$		$
E. COAL	$		$		$
F. TOTAL			$ 533.63	---------->	$ 4,973.43

3. NONENERGY SAVINGS(+) / COST(-)
   A. ANNUAL RECURRING (+/-) $ 0
      (1) DISCOUNT FACTOR (TABLE A) ______
      (2) DISCOUNTED SAVING/COST (3A X 3A1) $ 0

   B. NONRECURRING SAVINGS(+) / COST(-)

ITEM	SAVINGS(+) COST (-)(1)	YEAR OF OCCURRENCE(2)	DISCOUNT FACTOR(3)	DISCOUNTED SAVINGS(+) COST(-)(4)
(1)	$			$
(2)	$			$
(3)	$			$
(4) TOTAL	$			$

   C. TOTAL NONENERGY DISCOUNTED SAVINGS(+) / COST(-) (3A2+3Bd4) $ ______

   D. PROJECT NONENERGY QUALIFICATION TEST
      (1) 25% MAX NONENERGY CALC (2F5 X .33) $ 1,641.23
         a. IF 3D1 IS = OR > 3C GO TO ITEM 4
         b. IF 3D1 IS < 3C CALC SIR = (2F5+3D1) ÷ 1F = ______
         c. IF 3D1b IS = > 1 GO TO ITEM 4
         d. IF 3D1b IS < 1 PROJECT DOES NOT QUALIFY

4. FIRST YEAR DOLLAR SAVINGS 2F3+3A+(3B1d ÷ YEARS ECONOMIC LIFE) $ 533.63

5. TOTAL NET DISCOUNTED SAVINGS (2F5+3C) $ 4,973.43

6. DISCOUNTED SAVINGS RATIO (IF < 1 PROJECT DOES NOT QUALIFY)(SIR)=(5 :1F)= 2.81

Cost for Heat Pump Repair = $270.00
(see page 4-60 to 4-60E)

Payback = $270.00 / $533.63 = 0.51 year

SIR = 6.43
(see attached

Repairing the heat pumps is more cost effective than replacing them.

CEDRIC D. O. CHONG & ASSOCIATES, INC.
CONSULTING MECHANICAL & ELECTRICAL ENGINEERS
2130-E North King Street Honolulu, Hawaii 96819
Telephone (808) 847-6557 Telefax: (808) 847-6550

DATE:	JOB No.:
PROJECT NAME:	BY:
SUBJECT:	Sht. 4-42A 01

LIFE CYCLE COST ANALYSIS SUMMARY
ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP)

LOCATION: ______ REGION NO. ______ PROJECT NUMBER ______

PROJECT TITLE Repair Broken Heat Pumps FISCAL YEAR ______

DISCRETE PORTION NAME Unit Type 57-II, 57-IV, 57-VI, 57-VIII, 57-IX

ANALYSIS DATE ______ ECONOMIC LIFE 4 YEARS PREPARED BY ______

1. INVESTMENT
   - A. CONSTRUCTION COST $ 270.00
   - B. SIOH (5.5%) $ 14.85
   - C. DESIGN COST (10%) $ 27.00
   - D. ENERGY CREDIT CALC (1A+1B+1C)X.9 $ 280.67
   - E. SALVAGE VALUE - $ —
   - F. TOTAL INVESTMENT (1D-1E) $ 280.67

2. ENERGY SAVINGS (+) / COST (-)
   ANALYSIS DATE ANNUAL SAVINGS, UNIT COST & DISCOUNTED SAVINGS

FUEL	COST $/MBTU/YR(1)	SAVINGS MBTU/YR(2)	ANNUAL $ SAVINGS(3)	DISCOUNT FACTOR(4)	DISCOUNTED SAVINGS(5)
A. ELEC	$ 19.92	26.785/unit	$ 533.63	3.38	$ 1,803.67
B. DIST	$		$		$
C. RESID	$		$		$
D. NG	$		$		$
E. COAL	$		$		$
F. TOTAL			$ 533.63		----------> $ 1,803.67

3. NONENERGY SAVINGS(+) / COST(-)
   - A. ANNUAL RECURRING (+/-) $ 0
     - (1) DISCOUNT FACTOR (TABLE A) ______
     - (2) DISCOUNTED SAVING/COST (3A X 3A1) $ 0
   - B. NONRECURRING SAVINGS(+) / COST(-)

ITEM	SAVINGS(+) COST (-)(1)	YEAR OF OCCURRENCE(2)	DISCOUNT FACTOR(3)	DISCOUNTED SAVINGS(+) COST(-)(4)
(1)	$			$
(2)	$			$
(3)	$			$
(4) TOTAL	$			$

   - C. TOTAL NONENERGY DISCOUNTED SAVINGS(+) / COST(-) (3A2+3Bd4) $ ______
   - D. PROJECT NONENERGY QUALIFICATION TEST
     - (1) 25% MAX NONENERGY CALC (2F5 X .33) $ 595.21
       - a. IF 3D1 IS = OR > 3C GO TO ITEM 4
       - b. IF 3D1 IS < 3C CALC SIR = (2F5+3D1) ÷ 1F = ______
       - c. IF 3D1b IS = > 1 GO TO ITEM 4
       - d. IF 3D1b IS < 1 PROJECT DOES NOT QUALIFY

4. FIRST YEAR DOLLAR SAVINGS 2F3+3A+(3B1d ÷ YEARS ECONOMIC LIFE) $ 533.63

5. TOTAL NET DISCOUNTED SAVINGS (2F5+3C) $ 1,803.67

6. DISCOUNTED SAVINGS RATIO (IF < 1 PROJECT DOES NOT QUALIFY)(SIR)=(5 ÷ 1F)= 6.43

j. Unit Type 57-III

Energy use without heat pump:

$$\frac{\left[(264.6\ gal/day)(1\ BTU/lb\text{-}F)(8.33\ lb/gal)(120-70F)\right]}{(3413\ BTUH/KW)} = 32.3\ \frac{KWH}{Day}$$

Energy Use with heat pump:

$$\frac{\left[(264.6\ gal/day)(1\ BTU/lb\text{-}F)(8.33\ lb/gal)(120-70F)\right]}{(3413\ BTUH/KW)(3.0\ COP)} = 10.8\ \frac{KWH}{day}$$

Daily Energy Savings = 32.3 − 10.8 = 21.5 KWH/Day

ANNUAL ENERGY SAVINGS
= 21.5 KWH/day × (365 day/yr) = 7,848 KWH/yr

ANNUAL COST SAVINGS
= 7,848 KWH/yr × ($0.068 /KWH) = $ 533.63

Cost for heat pump replacement = $ 1,700
(see attached)

$$\text{Payback} = \frac{\$\ 1,700}{\$\ 533.63\ /yr} = 3.19\ yrs$$

SIR = 2.81 (see attached)

∴ Replacement of broken heat pump units would be cost effective.

[CE]DRIC D. O. CHONG & ASSOCIATES, INC.
[CO]NSULTING MECHANICAL & ELECTRICAL ENGINEERS
2130-E North King Street Honolulu, Hawaii 96819
Telephone (808) 847-6557 Telefax: (808) 847-6550

DATE: JOB No.:
PROJECT NAME: BY:
SUBJECT:

Replace Broken Heat Pumps

ESTIMATOR	CHECKED BY	SHEET OF SHEETS

TASK DESCRIPTION	QUANTITY		LABOR				EQUIPMENT		MATERIAL		TOTAL
	NO. OF UNITS	UNIT MEAS	MH/UNIT	TOTAL HRS	UNIT PRICE	COST	UNIT PRICE	COST	UNIT PRICE	COST	
New Heat Pump	1	EA	4	4	39.60	158.40			1120	1120.00	1,278.40
									SUBTOTAL		1,278.40
									O/H	(15%)	191.76
									Profit	(10%)	147.02
									TAX	(4%)	64.69
									BOND	(1%)	16.82
									TOTAL		1698.69
									SAY	$1700	

DA FORM 5418-R, Apr 85 CONTD

LIFE CYCLE COST ANALYSIS SUMMARY
ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP)

LOCATION: ______ REGION NO. ______ PROJECT NUMBER ______

PROJECT TITLE Replace Broken Heat Pumps FISCAL YEAR ______

DISCRETE PORTION NAME Unit Type 57-III

ANALYSIS DATE ______ ECONOMIC LIFE 15 YEARS PREPARED BY ______

1. INVESTMENT
   - A. CONSTRUCTION COST $ 1700.00
   - B. SIOH (5.5%) $ 93.50
   - C. DESIGN COST (10%) $ 170.00
   - D. ENERGY CREDIT CALC (1A+1B+1C)X.9 $ 1767.15
   - E. SALVAGE VALUE - $ —
   - F. TOTAL INVESTMENT (1D-1E) $ 1767.15

2. ENERGY SAVINGS (+) / COST (-)
   ANALYSIS DATE ANNUAL SAVINGS, UNIT COST & DISCOUNTED SAVINGS

FUEL	COST $/MBTU/YR(1)	SAVINGS MBTU/YR(2)	ANNUAL $ SAVINGS(3)	DISCOUNT FACTOR(4)	DISCOUNTED SAVINGS(5)
A. ELEC	$ 19.92	26.785/unit	$ 533.63	9.32	$ 4,973.43
B. DIST	$		$		$
C. RESID	$		$		$
D. NG	$		$		$
E. COAL	$		$		$
F. TOTAL			$ 533.63		----------> $ 4,973.43

3. NONENERGY SAVINGS(+) / COST(-)
   - A. ANNUAL RECURRING (+/-) $ 0
     - (1) DISCOUNT FACTOR (TABLE A) ______
     - (2) DISCOUNTED SAVING/COST (3A X 3A1) $ 0

   - B. NONRECURRING SAVINGS(+) / COST(-)

ITEM	SAVINGS(+) COST (-)(1)	YEAR OF OCCURRENCE(2)	DISCOUNT FACTOR(3)	DISCOUNTED SAVINGS(+) COST(-)(4)
(1)	$			$
(2)	$			$
(3)	$			$
(4) TOTAL	$			$

   - C. TOTAL NONENERGY DISCOUNTED SAVINGS(+) / COST(-) (3A2+3Bd4) $ ______

   - D. PROJECT NONENERGY QUALIFICATION TEST
     - (1) 25% MAX NONENERGY CALC (2F5 X .33) $ 1,641.23
       - a. IF 3D1 IS = OR > 3C GO TO ITEM 4
       - b. IF 3D1 IS < 3C CALC SIR = (2F5+3D1) + 1F = ______
       - c. IF 3D1b IS = > 1 GO TO ITEM 4
       - d. IF 3D1b IS < 1 PROJECT DOES NOT QUALIFY

4. FIRST YEAR DOLLAR SAVINGS 2F3+3A+(3B1d + YEARS ECONOMIC LIFE) $ 533.63

5. TOTAL NET DISCOUNTED SAVINGS (2F5+3C) $ 4,973.43

6. DISCOUNTED SAVINGS RATIO (IF < 1 PROJECT DOES NOT QUALIFY)(SIR)=(5 :1F)= 2.81

Cost for Heat Pump Repair = $270.00
(see page 4-60 to 4-60E)

$$\text{Payback} = \frac{\$270.00}{\$533.63} = 0.51 \text{ year}$$

SIR = 6.43
(see attached

Repairing the heat pumps is more cost effective than replacing them.

CEDRIC D. O. CHONG & ASSOCIATES, INC.
CONSULTING MECHANICAL & ELECTRICAL ENGINEERS
2130-E North King Street Honolulu, Hawaii 96819
Telephone (808) 847-6557 Telefax: (808) 847-6550

DATE:	JOB No.:
PROJECT NAME:	BY:
SUBJECT:	Sht. 4-45A 01

LIFE CYCLE COST ANALYSIS SUMMARY
ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP)

LOCATION: ______ REGION NO. ______ PROJECT NUMBER ______

PROJECT TITLE Repair Broken Heat Pumps FISCAL YEAR ______

DISCRETE PORTION NAME Unit Type 57-III

ANALYSIS DATE ______ ECONOMIC LIFE 4 YEARS PREPARED BY ______

1. INVESTMENT
   A. CONSTRUCTION COST $ 270.00
   B. SIOH (5.5%) $ 14.85
   C. DESIGN COST (10%) $ 27.00
   D. ENERGY CREDIT CALC (1A+1B+1C)X.9 $ 280.67
   E. SALVAGE VALUE - $ —
   F. TOTAL INVESTMENT (1D-1E) $ 280.67

2. ENERGY SAVINGS (+) / COST (-)
   ANALYSIS DATE ANNUAL SAVINGS, UNIT COST & DISCOUNTED SAVINGS

	FUEL	COST $/MBTU/YR(1)	SAVINGS MBTU/YR(2)	ANNUAL $ SAVINGS(3)	DISCOUNT FACTOR(4)	DISCOUNTED SAVINGS(5)
A.	ELEC	$ 19.92	26.785/unit	$ 533.63	3.38	$ 1,803.67
B.	DIST	$		$		$
C.	RESID	$		$		$
D.	NG	$		$		$
E.	COAL	$		$		$
F.	TOTAL			$ 533.63		-----------> $ 1,803.67

3. NONENERGY SAVINGS(+) / COST(-)
   A. ANNUAL RECURRING (+/-) $ 0
      (1) DISCOUNT FACTOR (TABLE A) ______
      (2) DISCOUNTED SAVING/COST (3A X 3A1) $ 0

   B. NONRECURRING SAVINGS(+) / COST(-)

ITEM	SAVINGS(+) COST (-)(1)	YEAR OF OCCURRENCE(2)	DISCOUNT FACTOR(3)	DISCOUNTED SAVINGS(+) COST(-)(4)
(1)	$			$
(2)	$			$
(3)	$			$
(4) TOTAL	$			$

   C. TOTAL NONENERGY DISCOUNTED SAVINGS(+) / COST(-) (3A2+3Bd4) $ ______

   D. PROJECT NONENERGY QUALIFICATION TEST
      (1) 25% MAX NONENERGY CALC (2F5 X .33) $ 595.21
         a. IF 3D1 IS = OR > 3C GO TO ITEM 4
         b. IF 3D1 IS < 3C CALC SIR = (2F5+3D1) ÷ 1F = ______
         c. IF 3D1b IS = > 1 GO TO ITEM 4
         d. IF 3D1b IS < 1 PROJECT DOES NOT QUALIFY

4. FIRST YEAR DOLLAR SAVINGS 2F3+3A+(3B1d ÷ YEARS ECONOMIC LIFE) $ 533.63

5. TOTAL NET DISCOUNTED SAVINGS (2F5+3C) $ 1,803.67

6. DISCOUNTED SAVINGS RATIO (IF < 1 PROJECT DOES NOT QUALIFY)(SIR)=(5 ÷ 1F)= 6.43

K. Unit Type 57-V (& 57-VII)

Energy use without heat pump:

$$\frac{(198.4\ gal/day)(1\ BTU/lb\cdot F)(8.33\ lb/gal)(120-70F)}{(3413\ BTUH/KW)} = 24.2\ \frac{KWH}{Day}$$

Energy Use with heat pump:

$$\frac{(198.4\ gal/day)(1\ BTU/lb\cdot F)(8.33\ lb/gal)(120-70F)}{(3413\ BTUH/KW)(3.0\ COP)} = 8.1\ \frac{KWH}{day}$$

Daily Energy Savings = 24.2 − 8.1 = 16.1 KWH/Day

ANNUAL ENERGY SAVINGS
= 16.1 KWH/day × (365 day/yr) = 5,877 KWH/yr

ANNUAL COST SAVINGS
= 5,877 KWH/yr × ($0.068/KWH) = $ 399.64

Cost for heat pump replacement = $ 1,700
(see attached)

$$\text{Payback} = \frac{\$\ 1,700}{\$\ 399.64\ /yr} = 4.3\ yrs$$

SIR = 2.11 (see attached)

∴ Replacement of broken heat pump units would be cost effective

[redacted]DRIC D. O. CHONG & ASSOCIATES, INC.
[redacted]ONSULTING MECHANICAL & ELECTRICAL ENGINEERS
2130-E North King Street Honolulu, Hawaii 96819
Telephone (808) 847-6557 Telefax: (808) 847-6550

DATE:	JOB No.:
PROJECT NAME:	BY:
SUBJECT:	Sht. of 4-46

PI. Replace Broken Heat Pumps | ESTIMATOR | CHECKED BY | SHEET OF SHEETS

TASK DESCRIPTION	QUANTITY		LABOR				EQUIPMENT		MATERIAL		TOTAL
	NO. OF UNITS	UNIT MEAS	MH/UNIT	TOTAL HRS	UNIT PRICE	COST	UNIT PRICE	COST	UNIT PRICE	COST	
New Heat Pump	1	EA	4	4	39.60	158.40			1120	1120.00	1,278.40
									SUBTOTAL		1,278.40
									O/H (15%)		191.76
									Profit (10%)		147.02
									TAX (4%)		64.69
									BOND (1%)		16.82
									TOTAL		1698.69
									SAY	$1700	

DA FORM 5418-R, Apr 85 CONTD

LIFE CYCLE COST ANALYSIS SUMMARY
ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP)

LOCATION: ______ REGION NO. ______ PROJECT NUMBER ______

PROJECT TITLE Replace Broken Heat Pumps FISCAL YEAR ______

DISCRETE PORTION NAME Unit Type 57-V, VII

ANALYSIS DATE ______ ECONOMIC LIFE 15 YEARS PREPARED BY ______

1. INVESTMENT
   A. CONSTRUCTION COST $ 1700.00
   B. SIOH (5.5%) $ 93.50
   C. DESIGN COST (10%) $ 170.00
   D. ENERGY CREDIT CALC (1A+1B+1C)X.9 $ 1767.15
   E. SALVAGE VALUE - $ —
   F. TOTAL INVESTMENT (1D-1E) $ 1767.15

2. ENERGY SAVINGS (+) / COST (-)
   ANALYSIS DATE ANNUAL SAVINGS, UNIT COST & DISCOUNTED SAVINGS

FUEL	COST $/MBTU/YR(1)	SAVINGS MBTU/YR(2)	ANNUAL $ SAVINGS(3)	DISCOUNT FACTOR(4)	DISCOUNTED SAVINGS(5)
A. ELEC	$ 19.92	20.058/unit	$ 399.64	9.32	$ 3,724.64
B. DIST	$		$		$
C. RESID	$		$		$
D. NG	$		$		$
E. COAL	$		$		$
F. TOTAL			$ 399.64		----------> $ 3,724.64

3. NONENERGY SAVINGS(+) / COST(-)
   A. ANNUAL RECURRING (+/-) $ 0
      (1) DISCOUNT FACTOR (TABLE A) ______
      (2) DISCOUNTED SAVING/COST (3A X 3A1) $ 0

   B. NONRECURRING SAVINGS(+) / COST(-)

ITEM	SAVINGS(+) COST (-)(1)	YEAR OF OCCURRENCE(2)	DISCOUNT FACTOR(3)	DISCOUNTED SAVINGS(+) COST(-)(4)
(1)	$			$
(2)	$			$
(3)	$			$
(4) TOTAL	$			$

   C. TOTAL NONENERGY DISCOUNTED SAVINGS(+) / COST(-) (3A2+3Bd4) $ ______

   D. PROJECT NONENERGY QUALIFICATION TEST
      (1) 25% MAX NONENERGY CALC (2F5 X .33) $ 1,229.13
         a. IF 3D1 IS = OR > 3C GO TO ITEM 4
         b. IF 3D1 IS < 3C CALC SIR = (2F5+3D1) ÷ 1F = ______
         c. IF 3D1b IS = > 1 GO TO ITEM 4
         d. IF 3D1b IS < 1 PROJECT DOES NOT QUALIFY

4. FIRST YEAR DOLLAR SAVINGS 2F3+3A+(3B1d ÷ YEARS ECONOMIC LIFE) $ 399.64

5. TOTAL NET DISCOUNTED SAVINGS (2F5+3C) $ 3,724.64

6. DISCOUNTED SAVINGS RATIO (IF < 1 PROJECT DOES NOT QUALIFY)(SIR)=(5 ÷1F)= 2.11

Cost for Heat Pump Repair = $270.00
(see page 4-60 C to 4-60C)

$$\text{Payback} = \frac{\$270.00}{\$399.64} = 0.68 \text{ year}$$

SIR = 4.81
(see attached

Repairing the heat pumps is more cost effective than replacing them.

CEDRIC D. O. CHONG & ASSOCIATES, INC.
CONSULTING MECHANICAL & ELECTRICAL ENGINEERS
1130-E North King Street Honolulu, Hawaii 96819
Telephone (808) 847-6557 Telefax: (808) 847-6550

DATE: JOB No.:
PROJECT NAME: BY:
SUBJECT: Sht. 4-48A
01

LIFE CYCLE COST ANALYSIS SUMMARY
ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP)

LOCATION: ______ REGION NO. ______ PROJECT NUMBER ______

PROJECT TITLE Repair Broken Heat Pumps FISCAL YEAR ______

DISCRETE PORTION NAME Unit Type 57-V & 57-VII

ANALYSIS DATE ______ ECONOMIC LIFE 4 YEARS PREPARED BY ______

1. INVESTMENT
   - A. CONSTRUCTION COST $ 270.00
   - B. SIOH (5.5%) $ 14.85
   - C. DESIGN COST (10%) $ 27.00
   - D. ENERGY CREDIT CALC (1A+1B+1C)X.9 $ 280.67
   - E. SALVAGE VALUE - $ —
   - F. TOTAL INVESTMENT (1D-1E) $ 280.67

2. ENERGY SAVINGS (+) / COST (-)
   ANALYSIS DATE ANNUAL SAVINGS, UNIT COST & DISCOUNTED SAVINGS

FUEL	COST $/MBTU/YR(1)	SAVINGS MBTU/YR(2)	ANNUAL $ SAVINGS(3)	DISCOUNT FACTOR(4)	DISCOUNTED SAVINGS(5)
A. ELEC	$ 19.92	20.058/unit	$ 399.64	3.38	$ 1,350.78
B. DIST	$		$		$
C. RESID	$		$		$
D. NG	$		$		$
E. COAL	$		$		$
F. TOTAL			$ 399.64		----------> $ 1,350.78

3. NONENERGY SAVINGS(+) / COST(-)
   - A. ANNUAL RECURRING (+/-) $ 0
     - (1) DISCOUNT FACTOR (TABLE A) ______
     - (2) DISCOUNTED SAVING/COST (3A X 3A1) $ 0
   - B. NONRECURRING SAVINGS(+) / COST(-)

ITEM	SAVINGS(+) COST (-)(1)	YEAR OF OCCURRENCE(2)	DISCOUNT FACTOR(3)	DISCOUNTED SAVINGS(+) COST(-)(4)
(1)	$			$
(2)	$			$
(3)	$			$
(4) TOTAL	$			$

   - C. TOTAL NONENERGY DISCOUNTED SAVINGS(+) / COST(-) (3A2+3Bd4) $ ______
   - D. PROJECT NONENERGY QUALIFICATION TEST
     - (1) 25% MAX NONENERGY CALC (2F5 X .33) $ 445.76
       - a. IF 3D1 IS = OR > 3C GO TO ITEM 4
       - b. IF 3D1 IS < 3C CALC SIR = (2F5+3D1) ÷ 1F = ______
       - c. IF 3D1b IS = > 1 GO TO ITEM 4
       - d. IF 3D1b IS < 1 PROJECT DOES NOT QUALIFY

4. FIRST YEAR DOLLAR SAVINGS 2F3+3A+(3B1d ÷ YEARS ECONOMIC LIFE) $ 399.64

5. TOTAL NET DISCOUNTED SAVINGS (2F5+3C) $ 1,350.78

6. DISCOUNTED SAVINGS RATIO (IF < 1 PROJECT DOES NOT QUALIFY)(SIR)=(5 ÷ 1F)= 4.81

4-48B

2. Unit Type 60-I

Energy use without heat pump:

$$\frac{[(198.4\ \text{gal/day})(1\ \text{BTU/lb-F})(8.33\ \text{lb/gal})(120-70F)]}{(3413\ \text{BTUH/KW})} = 24.2\ \frac{\text{KWH}}{\text{Day}}$$

Energy Use with heat pump:

$$\frac{[(198.4\ \text{gal/day})(1\ \text{BTU/lb-F})(8.33\ \text{lb/gal})(120-70F)]}{(3413\ \text{BTUH/KW})(3.0\ \text{COP})} = 8.1\ \frac{\text{KWH}}{\text{day}}$$

Daily Energy Savings: = 24.2 - 8.1 = 16.1 KWH/Day

ANNUAL ENERGY SAVINGS
= 16.1 KWH/day × (365 day/yr) = 5,877 KWH/yr

ANNUAL COST SAVINGS
= 5,877 KWH/yr × ($0.068/KWH) = $ 399.64

Cost for heat pump replacement = $ 1,700
(see attached)

$$\text{Payback} = \frac{\$\ 1{,}700}{\$\ 399.64\ /\text{yr}} = 4.3\ \text{yrs}$$

SIR = 2.11 (see attached)

∴ Replacement of broken heat pump units would be cost effective.

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CONSULTING MECHANICAL & ELECTRICAL ENGINEERS
2130-E North King Street Honolulu, Hawaii 96819
Telephone (808) 847-6557 Telefax: (808) 847-6550

DATE: | JOB No.:
PROJECT NAME: | BY:
SUBJECT: | Sht. Of 4-49

Replace Broken Heat Pumps

TASK DESCRIPTION	QUANTITY		LABOR				EQUIPMENT		MATERIAL		TOTAL
	NO. OF UNITS	UNIT MEAS	MH/UNIT	TOTAL HRS	UNIT PRICE	COST	UNIT PRICE	COST	UNIT PRICE	COST	
New Heat Pump	1	EA	4	4	39.60	158.40			1120	1120.00	1,278.40
									SUBTOTAL		1,278.40
									O/H (15%)		191.76
									Profit (10%)		147.02
									TAX (4%)		64.69
									BOND (1%)		16.82
									TOTAL		1698.69
									SAY	$1700	

ESTIMATOR CHECKED BY SHEET OF SHEETS

DA FORM 5418-R, Apr 85 CONTD

LIFE CYCLE COST ANALYSIS SUMMARY
ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP)

LOCATION: ____________ REGION NO. ______ PROJECT NUMBER ______

PROJECT TITLE Replace Broken Heat Pumps FISCAL YEAR ______

DISCRETE PORTION NAME Unit Type 60-I

ANALYSIS DATE ______ ECONOMIC LIFE 15 YEARS PREPARED BY ______

1. INVESTMENT
   - A. CONSTRUCTION COST — $ 1700.00
   - B. SIOH (5.5%) — $ 93.50
   - C. DESIGN COST (10%) — $ 170.00
   - D. ENERGY CREDIT CALC (1A+1B+1C)X.9 — $ 1767.15
   - E. SALVAGE VALUE — - $ —
   - F. TOTAL INVESTMENT (1D-1E) — $ 1767.15

2. ENERGY SAVINGS (+) / COST (-)
   ANALYSIS DATE ANNUAL SAVINGS, UNIT COST & DISCOUNTED SAVINGS

FUEL	COST $/MBTU/YR(1)	SAVINGS MBTU/YR(2)	ANNUAL $ SAVINGS(3)	DISCOUNT FACTOR(4)	DISCOUNTED SAVINGS(5)
A. ELEC	$ 19.92	20.058/unit	$ 399.64	9.32	$ 3,724.64
B. DIST	$		$		$
C. RESID	$		$		$
D. NG	$		$		$
E. COAL	$		$		$
F. TOTAL			$ 399.64		----------> $ 3,724.64

3. NONENERGY SAVINGS(+) / COST(-)
   - A. ANNUAL RECURRING (+/-) — $ 0
     - (1) DISCOUNT FACTOR (TABLE A) ______
     - (2) DISCOUNTED SAVING/COST (3A X 3A1) — $ 0
   - B. NONRECURRING SAVINGS(+) / COST(-)

ITEM	SAVINGS(+) COST (-)(1)	YEAR OF OCCURRENCE(2)	DISCOUNT FACTOR(3)	DISCOUNTED SAVINGS(+) COST(-)(4)
(1)	$			$
(2)	$			$
(3)	$			$
(4) TOTAL	$			$

   - C. TOTAL NONENERGY DISCOUNTED SAVINGS(+) / COST(-) (3A2+3Bd4) — $ 1,229.13
   - D. PROJECT NONENERGY QUALIFICATION TEST
     - (1) 25% MAX NONENERGY CALC (2F5 X .33) — $ ______
       - a. IF 3D1 IS = OR > 3C GO TO ITEM 4
       - b. IF 3D1 IS < 3C CALC SIR = (2F5+3D1) ÷ 1F = ______
       - c. IF 3D1b IS = > 1 GO TO ITEM 4
       - d. IF 3D1b IS < 1 PROJECT DOES NOT QUALIFY

4. FIRST YEAR DOLLAR SAVINGS 2F3+3A+(3B1d ÷ YEARS ECONOMIC LIFE) — $ 399.64

5. TOTAL NET DISCOUNTED SAVINGS (2F5+3C) — $ 3,724.64

6. DISCOUNTED SAVINGS RATIO (IF < 1 PROJECT DOES NOT QUALIFY)(SIR)=(5 ÷ 1F)= 2.11

Cost for Heat Pump Repair = $270.00
(see page 4-60 to 4-60E)

Payback = $\frac{\$270.00}{\$399.64}$ = 0.68 year

SIR = 4.81
(see attached

Repairing the heat pumps is more cost effective than replacing them.

CEDRIC D. O. CHONG & ASSOCIATES, INC.
CONSULTING MECHANICAL & ELECTRICAL ENGINEERS
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Telephone (808) 847-6557 Telefax: (808) 847-6550

DATE: JOB No.:

PROJECT NAME: BY:

SUBJECT: Sht. 4-51A
01

LIFE CYCLE COST ANALYSIS SUMMARY
ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP)

LOCATION: ______ REGION NO. ______ PROJECT NUMBER ______

PROJECT TITLE Repair Broken Heat Pumps FISCAL YEAR ______

DISCRETE PORTION NAME Unit Type 60-I

ANALYSIS DATE ______ ECONOMIC LIFE 4 YEARS PREPARED BY ______

1. INVESTMENT
   A. CONSTRUCTION COST $ 270.00
   B. SIOH (5.5%) $ 14.85
   C. DESIGN COST (10%) $ 27.00
   D. ENERGY CREDIT CALC (1A+1B+1C)X.9 $ 280.67
   E. SALVAGE VALUE - $ —
   F. TOTAL INVESTMENT (1D-1E) $ 280.67

2. ENERGY SAVINGS (+) / COST (-)
   ANALYSIS DATE ANNUAL SAVINGS, UNIT COST & DISCOUNTED SAVINGS

FUEL	COST $/MBTU/YR(1)	SAVINGS MBTU/YR(2)	ANNUAL $ SAVINGS(3)	DISCOUNT FACTOR(4)	DISCOUNTED SAVINGS(5)
A. ELEC	$ 19.92	20.058/unit	$399.64	3.38	$ 1,350.78
B. DIST	$		$		$
C. RESID	$		$		$
D. NG	$		$		$
E. COAL	$		$		$
F. TOTAL			$ 399.64		----------> $ 1,350.78

3. NONENERGY SAVINGS(+) / COST(-)
   A. ANNUAL RECURRING (+/-) $ 0
      (1) DISCOUNT FACTOR (TABLE A) ______
      (2) DISCOUNTED SAVING/COST (3A X 3A1) $ 0

   B. NONRECURRING SAVINGS(+) / COST(-)

ITEM	SAVINGS(+) COST (-)(1)	YEAR OF OCCURRENCE(2)	DISCOUNT FACTOR(3)	DISCOUNTED SAVINGS(+) COST(-)(4)
(1)	$			$
(2)	$			$
(3)	$			$
(4) TOTAL	$			$

   C. TOTAL NONENERGY DISCOUNTED SAVINGS(+) / COST(-) (3A2+3Bd4) $ ______

   D. PROJECT NONENERGY QUALIFICATION TEST
      (1) 25% MAX NONENERGY CALC (2F5 X .33) $ 445.76
         a. IF 3D1 IS = OR > 3C GO TO ITEM 4
         b. IF 3D1 IS < 3C CALC SIR = (2F5+3D1) ÷ 1F = ______
         c. IF 3D1b IS = > 1 GO TO ITEM 4
         d. IF 3D1b IS < 1 PROJECT DOES NOT QUALIFY

4. FIRST YEAR DOLLAR SAVINGS 2F3+3A+(3B1d ÷ YEARS ECONOMIC LIFE) $ 399.64

5. TOTAL NET DISCOUNTED SAVINGS (2F5+3C) $ 1,350.78

6. DISCOUNTED SAVINGS RATIO (IF < 1 PROJECT DOES NOT QUALIFY)(SIR)=(5 ÷ 1F)= 4.81

M. Unit Type 60-II

Energy use without heat pump:

$$\frac{[(330.7\ gal/day)(1\ BTU/lb\text{-}F)(8.33\ lb/gal)(120-70F)]}{(3413\ BTUH/KW)} = 40.4\ \frac{KWH}{Day}$$

Energy Use with heat pump:

$$\frac{[(330.7\ gal/day)(1\ BTU/lb\text{-}F)(8.33\ lb/gal)(120-70F)]}{(3413\ BTUH/KW)(3.0\ COP)} = 13.5\ \frac{KWH}{day}$$

Daily Energy Savings = 40.4 - 13.5 = 26.9 KWH/Day

ANNUAL ENERGY SAVINGS
= 26.9 KWH/day x (365 day/yr) = 9,819 KWH/yr

ANNUAL COST SAVINGS
= 9,819 KWH/yr x ($0.068 /KWH) = $ 667.69

Cost for heat pump replacement = $ 1,700
(see attached)

$$\text{Payback} = \frac{\$\ 1,700}{\$\ 667.69\ /yr} = 2.5\ yrs$$

SIR = 3.52 (see attached)

∴ Replacement of broken heat pump units would be cost effective.

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DATE: JOB NO.:

PROJECT NAME: BY:

SUBJECT: Sht. Of 4-52

CT Replace Broken Heat Pumps

TASK DESCRIPTION	QUANTITY		LABOR				EQUIPMENT		MATERIAL		TOTAL
	NO. OF UNITS	UNIT MEAS	MH/UNIT	TOTAL HRS	UNIT PRICE	COST	UNIT PRICE	COST	UNIT PRICE	COST	
New Heat Pump	1	EA	4	4	39.60	158.40			1120	1120.00	1,278.40
									SUBTOTAL		1,278.40
									O/H	(15%)	191.76
									Profit	(10%)	147.02
									TAX	(4%)	64.69
									BOND	(1%)	16.82
									TOTAL		1698.69
									SAY	$1700	

ESTIMATOR | CHECKED BY | SHEET OF SHEETS

DA FORM 5418-R, Apr 85 CONTD

LIFE CYCLE COST ANALYSIS SUMMARY
ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP)

LOCATION: ______ REGION NO. ______ PROJECT NUMBER ______

PROJECT TITLE Replace Broken Heat Pumps FISCAL YEAR ______

DISCRETE PORTION NAME Unit Type 60-II

ANALYSIS DATE ______ ECONOMIC LIFE 15 YEARS PREPARED BY ______

1. INVESTMENT
   A. CONSTRUCTION COST $ 1700.00
   B. SIOH (5.5%) $ 93.50
   C. DESIGN COST (10%) $ 170.00
   D. ENERGY CREDIT CALC (1A+1B+1C)X.9 $ 1767.15
   E. SALVAGE VALUE - $ —
   F. TOTAL INVESTMENT (1D-1E) $ 1767.15

2. ENERGY SAVINGS (+) / COST (-)
   ANALYSIS DATE ANNUAL SAVINGS, UNIT COST & DISCOUNTED SAVINGS

FUEL	COST $/MBTU/YR(1)	SAVINGS MBTU/YR(2)	ANNUAL $ SAVINGS(3)	DISCOUNT FACTOR(4)	DISCOUNTED SAVINGS(5)
A. ELEC	$ 19.92	33.512/unit	$ 667.69	9.32	$ 6,222.87
B. DIST	$		$		$
C. RESID	$		$		$
D. NG	$		$		$
E. COAL	$		$		$
F. TOTAL			$ 667.69		----------> $ 6,222.87

3. NONENERGY SAVINGS(+) / COST(-)
   A. ANNUAL RECURRING (+/-) $ 0
      (1) DISCOUNT FACTOR (TABLE A) ______
      (2) DISCOUNTED SAVING/COST (3A X 3A1) $ 0

   B. NONRECURRING SAVINGS(+) / COST(-)

ITEM	SAVINGS(+) COST (-)(1)	YEAR OF OCCURRENCE(2)	DISCOUNT FACTOR(3)	DISCOUNTED SAVINGS(+) COST(-)(4)
(1)	$			$
(2)	$			$
(3)	$			$
(4) TOTAL	$			$

   C. TOTAL NONENERGY DISCOUNTED SAVINGS(+) / COST(-) (3A2+3Bd4) $ ______

   D. PROJECT NONENERGY QUALIFICATION TEST
      (1) 25% MAX NONENERGY CALC (2F5 X .33) $ 2,053.55
         a. IF 3D1 IS = OR > 3C GO TO ITEM 4
         b. IF 3D1 IS < 3C CALC SIR = (2F5+3D1) ÷ 1F = ______
         c. IF 3D1b IS = > 1 GO TO ITEM 4
         d. IF 3D1b IS < 1 PROJECT DOES NOT QUALIFY

4. FIRST YEAR DOLLAR SAVINGS 2F3+3A+(3B1d ÷ YEARS ECONOMIC LIFE) $ 667.69

5. TOTAL NET DISCOUNTED SAVINGS (2F5+3C) $ 6,222.87

6. DISCOUNTED SAVINGS RATIO (IF < 1 PROJECT DOES NOT QUALIFY)(SIR)=(5 ÷ 1F)= 3.52

Cost for Heat Pump Repair = $270.00
(see page 4-60 to 4-60c)

Payback = $\frac{\$270.00}{\$667.69}$ = 0.40 year

SIR = 8.04
(see attached

Repairing the heat pumps is more cost effective than replacing them.

CEDRIC D. O. CHONG & ASSOCIATES, INC.
CONSULTING MECHANICAL & ELECTRICAL ENGINEERS
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Telephone (808) 847-6557 Telefax: (808) 847-6550

DATE: | JOB No.:
PROJECT NAME: | BY:
SUBJECT: | Sht. 4-54A 01

LIFE CYCLE COST ANALYSIS SUMMARY
ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP)

LOCATION: ______ REGION NO. ______ PROJECT NUMBER ______

PROJECT TITLE Repair Broken Heat Pumps FISCAL YEAR ______

DISCRETE PORTION NAME Unit Type 60-II

ANALYSIS DATE ______ ECONOMIC LIFE 4 YEARS PREPARED BY ______

1. INVESTMENT
   - A. CONSTRUCTION COST $ 270.00
   - B. SIOH (5.5%) $ 14.85
   - C. DESIGN COST (10%) $ 27.00
   - D. ENERGY CREDIT CALC (1A+1B+1C)X.9 $ 280.67
   - E. SALVAGE VALUE - $ —
   - F. TOTAL INVESTMENT (1D-1E) $ 280.67

2. ENERGY SAVINGS (+) / COST (-)
   ANALYSIS DATE ANNUAL SAVINGS, UNIT COST & DISCOUNTED SAVINGS

FUEL	COST $/MBTU/YR(1)	SAVINGS MBTU/YR(2)	ANNUAL $ SAVINGS(3)	DISCOUNT FACTOR(4)	DISCOUNTED SAVINGS(5)
A. ELEC	$ 19.92	33.512/unit	$ 667.69	3.38	$ 2,256.79
B. DIST	$		$		$
C. RESID	$		$		$
D. NG	$		$		$
E. COAL	$		$		$
F. TOTAL			$ 667.69		----------> $ 2,256.79

3. NONENERGY SAVINGS(+) / COST(-)
   - A. ANNUAL RECURRING (+/-) $ 0
     - (1) DISCOUNT FACTOR (TABLE A) ______
     - (2) DISCOUNTED SAVING/COST (3A X 3A1) $ 0
   - B. NONRECURRING SAVINGS(+) / COST(-)

ITEM	SAVINGS(+) COST (-)(1)	YEAR OF OCCURRENCE(2)	DISCOUNT FACTOR(3)	DISCOUNTED SAVINGS(+) COST(-)(4)
(1)	$			$
(2)	$			$
(3)	$			$
(4) TOTAL	$			$

   - C. TOTAL NONENERGY DISCOUNTED SAVINGS(+) / COST(-) (3A2+3Bd4) $ ______
   - D. PROJECT NONENERGY QUALIFICATION TEST
     - (1) 25% MAX NONENERGY CALC (2F5 X .33) $ 744.74
       - a. IF 3D1 IS = OR > 3C GO TO ITEM 4
       - b. IF 3D1 IS < 3C CALC SIR = (2F5+3D1) ÷ 1F = ______
       - c. IF 3D1b IS = > 1 GO TO ITEM 4
       - d. IF 3D1b IS < 1 PROJECT DOES NOT QUALIFY

4. FIRST YEAR DOLLAR SAVINGS 2F3+3A+(3B1d ÷ YEARS ECONOMIC LIFE) $ 667.69

5. TOTAL NET DISCOUNTED SAVINGS (2F5+3C) $ 2,256.79

6. DISCOUNTED SAVINGS RATIO (IF < 1 PROJECT DOES NOT QUALIFY)(SIR)=(5 ÷ 1F)= 8.04

n. Unit Type 60-III

Energy use without heat pump:

$$\frac{\left[(264.6\ \text{gal/day})(1\ \text{BTU/lb-F})(8.33\ \text{lb/gal})(120-70F)\right]}{(3413\ \text{BTUH/KW})} = 32.3\ \frac{\text{KWH}}{\text{Day}}$$

Energy Use with heat pump:

$$\frac{\left[(264.6\ \text{gal/day})(1\ \text{BTU/lb-F})(8.33\ \text{lb/gal})(120-70F)\right]}{(3413\ \text{BTUH/KW})(3.0\ \text{COP})} = 10.8\ \frac{\text{KWH}}{\text{day}}$$

Daily Energy Savings = 32.3 − 10.8 = 21.5 KWH/Day

ANNUAL ENERGY SAVINGS
= 21.5 KWH/day × (365 day/yr) = 7,848 KWH/yr

ANNUAL COST SAVINGS
= 7848 KWH/yr × ($0.068 /KWH) = $ 533.66

Cost for heat pump replacement = $ 1,700
(see attached)

$$\text{Payback} = \frac{\$\ 1{,}700}{\$\ 533.66\ /\text{yr}} = 3.2\ \text{yrs}$$

SIR = 2.81 (see attached)

∴ Replacement of broken heat pump units would be cost effective.

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[1]130-E North King Street Honolulu, Hawaii 96819
Telephone (808) 847-6557 Telefax: (808) 847-6550

DATE:	JOB No.:
PROJECT NAME:	BY:
SUBJECT:	Sht. Of 4-55

F Replace Broken Heat Pumps | ESTIMATOR | CHECKED BY | SHEET OF SHEETS

TASK DESCRIPTION	QUANTITY: NO. OF UNITS	QUANTITY: UNIT MEAS	LABOR: MH/UNIT	LABOR: TOTAL HRS	LABOR: UNIT PRICE	LABOR: COST	EQUIPMENT: UNIT PRICE	EQUIPMENT: COST	MATERIAL: UNIT PRICE	MATERIAL: COST	TOTAL
New Heat Pump	1	EA	4	4	39.60	158.40			1120	1120.00	1,278.40
									SUB	TOTAL	1,278.40
									O/H	(15%)	191.76
									Pro	fit (10%)	147.02
									TAX	(4%)	64.69
									BOND	(1%)	16.82
									TOT	AL	1698.69
									SAY	$1700	

DA FORM 5418-R, Apr 85 CONTD

LIFE CYCLE COST ANALYSIS SUMMARY
ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP)

LOCATION: ______ REGION NO. ______ PROJECT NUMBER ______

PROJECT TITLE Replace Broken Heat Pumps FISCAL YEAR ______

DISCRETE PORTION NAME Unit Type 60-III

ANALYSIS DATE ______ ECONOMIC LIFE 15 YEARS PREPARED BY ______

1. INVESTMENT
   A. CONSTRUCTION COST $ 1700.00
   B. SIOH (5.5%) $ 93.50
   C. DESIGN COST (10%) $ 170.00
   D. ENERGY CREDIT CALC (1A+1B+1C)X.9 $ 1767.15
   E. SALVAGE VALUE - $ —
   F. TOTAL INVESTMENT (1D-1E) $ 1767.15

2. ENERGY SAVINGS (+) / COST (-)
   ANALYSIS DATE ANNUAL SAVINGS, UNIT COST & DISCOUNTED SAVINGS

FUEL	COST $/MBTU/YR(1)	SAVINGS MBTU/YR(2)	ANNUAL $ SAVINGS(3)	DISCOUNT FACTOR(4)	DISCOUNTED SAVINGS(5)
A. ELEC	$19.92	26.785/unit	$533.66	9.32	$ 4,973.71
B. DIST	$		$		$
C. RESID	$		$		$
D. NG	$		$		$
E. COAL	$		$		$
F. TOTAL			$ 533.66		----------> $ 4,973.71

3. NONENERGY SAVINGS(+) / COST(-)
   A. ANNUAL RECURRING (+/-) $ 0
      (1) DISCOUNT FACTOR (TABLE A) ______
      (2) DISCOUNTED SAVING/COST (3A X 3A1) $ 0

   B. NONRECURRING SAVINGS(+) / COST(-)

ITEM	SAVINGS(+) COST (-)(1)	YEAR OF OCCURRENCE(2)	DISCOUNT FACTOR(3)	DISCOUNTED SAVINGS(+) COST(-)(4)
(1)	$			$
(2)	$			$
(3)	$			$
(4) TOTAL	$			$

   C. TOTAL NONENERGY DISCOUNTED SAVINGS(+) / COST(-) (3A2+3Bd4) $ ______

   D. PROJECT NONENERGY QUALIFICATION TEST
      (1) 25% MAX NONENERGY CALC (2F5 X .33) $ 1,641.32
         a. IF 3D1 IS = OR > 3C GO TO ITEM 4
         b. IF 3D1 IS < 3C CALC SIR = (2F5+3D1) ÷ 1F = ______
         c. IF 3D1b IS = > 1 GO TO ITEM 4
         d. IF 3D1b IS < 1 PROJECT DOES NOT QUALIFY

4. FIRST YEAR DOLLAR SAVINGS 2F3+3A+(3B1d ÷ YEARS ECONOMIC LIFE) $ 533.66

5. TOTAL NET DISCOUNTED SAVINGS (2F5+3C) $ 4,973.71

6. DISCOUNTED SAVINGS RATIO (IF < 1 PROJECT DOES NOT QUALIFY)(SIR)=(5 ÷ 1F)= 2.81

Cost for Heat Pump Repair = $270.00
(see page 4-60 C to 4-60E)

Payback = $\frac{\$270.00}{\$533.66}$ = 0.51 year

SIR = 6.43
(see attached

Repairing the heat pumps is more cost effective than replacing them.

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DATE: JOB No.:
PROJECT NAME: BY:
SUBJECT: Sht. 4-57A
Of

LIFE CYCLE COST ANALYSIS SUMMARY
ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP)

LOCATION: ____________ REGION NO. ______ PROJECT NUMBER ______

PROJECT TITLE Repair Broken Heat Pumps FISCAL YEAR ______

DISCRETE PORTION NAME Unit Type 60-III

ANALYSIS DATE ______ ECONOMIC LIFE 4 YEARS PREPARED BY ______

1. INVESTMENT
   A. CONSTRUCTION COST $ 270.00
   B. SIOH (5.5%) $ 14.85
   C. DESIGN COST (10%) $ 27.00
   D. ENERGY CREDIT CALC (1A+1B+1C)X.9 $ 280.67
   E. SALVAGE VALUE - $ —
   F. TOTAL INVESTMENT (1D-1E) $ 280.67

2. ENERGY SAVINGS (+) / COST (-)
   ANALYSIS DATE ANNUAL SAVINGS, UNIT COST & DISCOUNTED SAVINGS

FUEL	COST $/MBTU/YR(1)	SAVINGS MBTU/YR(2)	ANNUAL $ SAVINGS(3)	DISCOUNT FACTOR(4)	DISCOUNTED SAVINGS(5)
A. ELEC	$ 19.92	26.785/unit	$ 533.66	3.38	$ 1,803.77
B. DIST	$		$		$
C. RESID	$		$		$
D. NG	$		$		$
E. COAL	$		$		$
F. TOTAL			$ 533.66		----------> $ 1,803.77

3. NONENERGY SAVINGS(+) / COST(-)
   A. ANNUAL RECURRING (+/-) $ 0
      (1) DISCOUNT FACTOR (TABLE A) ______
      (2) DISCOUNTED SAVING/COST (3A X 3A1) $ 0

   B. NONRECURRING SAVINGS(+) / COST(-)

ITEM	SAVINGS(+) COST (-)(1)	YEAR OF OCCURRENCE(2)	DISCOUNT FACTOR(3)	DISCOUNTED SAVINGS(+) COST(-)(4)
(1)	$			$
(2)	$			$
(3)	$			$
(4) TOTAL	$			$

   C. TOTAL NONENERGY DISCOUNTED SAVINGS(+) / COST(-) (3A2+3Bd4) $ ______

   D. PROJECT NONENERGY QUALIFICATION TEST
      (1) 25% MAX NONENERGY CALC (2F5 X .33) $ 595.24
         a. IF 3D1 IS = OR > 3C GO TO ITEM 4
         b. IF 3D1 IS < 3C CALC SIR = (2F5+3D1) ÷ 1F = ______
         c. IF 3D1b IS = > 1 GO TO ITEM 4
         d. IF 3D1b IS < 1 PROJECT DOES NOT QUALIFY

4. FIRST YEAR DOLLAR SAVINGS 2F3+3A+(3B1d ÷ YEARS ECONOMIC LIFE) $ 533.66

5. TOTAL NET DISCOUNTED SAVINGS (2F5+3C) $ 1,803.77

6. DISCOUNTED SAVINGS RATIO (IF < 1 PROJECT DOES NOT QUALIFY)(SIR)=(5 ÷ 1F)= 6.43

Unit Type 71-I

Energy use without heat pump:

$$\frac{[(330.7\ gal/day)(1\ BTU/lb\text{-}F)(8.33\ lb/gal)(120-70F)]}{(3413\ BTUH/KW)} = 40.4\ \frac{KWH}{Day}$$

Energy Use with heat pump:

$$\frac{[(330.7\ gal/day)(1\ BTU/lb\text{-}F)(8.33\ lb/gal)(120-70F)]}{(3413\ BTUH/KW)(3.0\ COP)} = 13.5\ \frac{KWH}{day}$$

Daily Energy Savings = 40.4 − 13.5 = 26.9 KWH/Day

ANNUAL ENERGY SAVINGS

= 26.9 KWH/day × (365 day/yr) = 9,819 KWH/yr

ANNUAL COST SAVINGS

= 9819 KWH/yr × (\$0.068 /KWH) = \$ 667.69

Cost for heat pump replacement = \$ 1700
(see attached)

$$\text{Payback} = \frac{\$\ 1700}{\$\ 667.69\ /yr} = 2.5\ yrs$$

SIR = 3.52 (see attached)

∴ Replacement of broken heat pump units would be cost effective.

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DATE: JOB No.:

PROJECT NAME: BY:

SUBJECT: Sht. Of 4-58

F[illegible] Replace Broken Heat Pumps | ESTIMATOR | CHECKED BY | SHEET OF [illegible]EETS

TASK DESCRIPTION	QUANTITY NO. OF UNITS	QUANTITY UNIT MEAS	LABOR MH/UNIT	LABOR TOTAL HRS	LABOR UNIT PRICE	LABOR COST	EQUIPMENT UNIT PRICE	EQUIPMENT COST	MATERIAL UNIT PRICE	MATERIAL COST	TOTAL
New Heat Pump	1	EA	4	4	39.60	158.40			1120	1120.00	1,278.40
									SUBTOTAL		1,278.40
									O/H	(15%)	191.76
									Profit	(10%)	147.02
									TAX	(4%)	64.69
									BOND	(1%)	16.82
									TOTAL		1698.69
									SAY	$1700	

DA FORM 5418-R, Apr 85 CONTD

LIFE CYCLE COST ANALYSIS SUMMARY
ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP)

LOCATION: ______ REGION NO. ______ PROJECT NUMBER ______

PROJECT TITLE Replace Broken Heat Pumps FISCAL YEAR ______

DISCRETE PORTION NAME Unit Type 71-I

ANALYSIS DATE ______ ECONOMIC LIFE 15 YEARS PREPARED BY ______

1. INVESTMENT

A.	CONSTRUCTION COST	$ 1700.00	
B.	SIOH (5.5%)	$ 93.50	
C.	DESIGN COST (10%)	$ 170.00	
D.	ENERGY CREDIT CALC (1A+1B+1C)X.9	$ 1767.15	
E.	SALVAGE VALUE	- $ —	
F.	TOTAL INVESTMENT (1D-1E)		$ 1767.15

2. ENERGY SAVINGS (+) / COST (-)
ANALYSIS DATE ANNUAL SAVINGS, UNIT COST & DISCOUNTED SAVINGS

FUEL	COST $/MBTU/YR(1)	SAVINGS MBTU/YR(2)	ANNUAL $ SAVINGS(3)	DISCOUNT FACTOR(4)	DISCOUNTED SAVINGS(5)
A. ELEC	$ 19.92	33.512/unit	$ 667.69	9.32	$ 6,222.87
B. DIST	$		$		$
C. RESID	$		$		$
D. NG	$		$		$
E. COAL	$		$		$
F. TOTAL			$ 667.69		----------> $ 6,222.87

3. NONENERGY SAVINGS(+) / COST(-)

A. ANNUAL RECURRING (+/-) $ 0
(1) DISCOUNT FACTOR (TABLE A) ______
(2) DISCOUNTED SAVING/COST (3A X 3A1) $ 0

B. NONRECURRING SAVINGS(+) / COST(-)

ITEM	SAVINGS(+) COST (-)(1)	YEAR OF OCCURRENCE(2)	DISCOUNT FACTOR(3)	DISCOUNTED SAVINGS(+) COST(-)(4)
(1)	$			$
(2)	$			$
(3)	$			$
(4) TOTAL	$			$

C. TOTAL NONENERGY DISCOUNTED SAVINGS(+) / COST(-) (3A2+3Bd4) $ ______

D. PROJECT NONENERGY QUALIFICATION TEST
(1) 25% MAX NONENERGY CALC (2F5 X .33) $ 2,053.55
a. IF 3D1 IS = OR > 3C GO TO ITEM 4
b. IF 3D1 IS < 3C CALC SIR = (2F5+3D1) ÷ 1F = ______
c. IF 3D1b IS = > 1 GO TO ITEM 4
d. IF 3D1b IS < 1 PROJECT DOES NOT QUALIFY

4. FIRST YEAR DOLLAR SAVINGS 2F3+3A+(3B1d ÷ YEARS ECONOMIC LIFE) $ 667.69

5. TOTAL NET DISCOUNTED SAVINGS (2F5+3C) $ 6,222.87

6. DISCOUNTED SAVINGS RATIO (IF < 1 PROJECT DOES NOT QUALIFY)(SIR)=(5 ÷ 1F)= 3.52

Cost for Heat Pump Repair = $270.00
(see page 4-60 (to 4-60E)

Payback = $\frac{\$270.00}{\$667.69}$ = 0.40 year

SIR = 8.04
(see attached

Repairing the heat pumps is more cost effective than replacing them.

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DATE:	JOB NO.:
PROJECT NAME:	BY:
SUBJECT:	Sht. 4-60A Of

LIFE CYCLE COST ANALYSIS SUMMARY
ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP)

LOCATION: ______ REGION NO. ______ PROJECT NUMBER ______

PROJECT TITLE Repair Broken Heat Pumps FISCAL YEAR ______

DISCRETE PORTION NAME Unit Type 71-I

ANALYSIS DATE ______ ECONOMIC LIFE 4 YEARS PREPARED BY ______

1. INVESTMENT
   A. CONSTRUCTION COST $ 270.00
   B. SIOH (5.5%) $ 14.85
   C. DESIGN COST (10%) $ 27.00
   D. ENERGY CREDIT CALC (1A+1B+1C)X.9 $ 280.67
   E. SALVAGE VALUE - $ —
   F. TOTAL INVESTMENT (1D-1E) $ 280.67

2. ENERGY SAVINGS (+) / COST (-)
   ANALYSIS DATE ANNUAL SAVINGS, UNIT COST & DISCOUNTED SAVINGS

FUEL	COST $/MBTU/YR(1)	SAVINGS MBTU/YR(2)	ANNUAL $ SAVINGS(3)	DISCOUNT FACTOR(4)	DISCOUNTED SAVINGS(5)
A. ELEC	$ 19.92	33.512/unit	$ 667.69	3.38	$ 2,256.79
B. DIST	$		$		$
C. RESID	$		$		$
D. NG	$		$		$
E. COAL	$		$		$
F. TOTAL			$ 667.69		----------> $ 2,256.79

3. NONENERGY SAVINGS(+) / COST(-)
   A. ANNUAL RECURRING (+/-) $ 0
      (1) DISCOUNT FACTOR (TABLE A) ______
      (2) DISCOUNTED SAVING/COST (3A X 3A1) $ 0

   B. NONRECURRING SAVINGS(+) / COST(-)

ITEM	SAVINGS(+) COST (-)(1)	YEAR OF OCCURRENCE(2)	DISCOUNT FACTOR(3)	DISCOUNTED SAVINGS(+) COST(-)(4)
(1)	$			$
(2)	$			$
(3)	$			$
(4) TOTAL	$			$

   C. TOTAL NONENERGY DISCOUNTED SAVINGS(+) / COST(-) (3A2+3Bd4) $ ______

   D. PROJECT NONENERGY QUALIFICATION TEST
      (1) 25% MAX NONENERGY CALC (2F5 X .33) $ 744.74
         a. IF 3D1 IS = OR > 3C GO TO ITEM 4
         b. IF 3D1 IS < 3C CALC SIR = (2F5+3D1) ÷ 1F = ______
         c. IF 3D1b IS = > 1 GO TO ITEM 4
         d. IF 3D1b IS < 1 PROJECT DOES NOT QUALIFY

4. FIRST YEAR DOLLAR SAVINGS 2F3+3A+(3B1d ÷ YEARS ECONOMIC LIFE) $ 667.69

5. TOTAL NET DISCOUNTED SAVINGS (2F5+3C) $ 2,256.79

6. DISCOUNTED SAVINGS RATIO (IF < 1 PROJECT DOES NOT QUALIFY)(SIR)=(5 ÷ 1F)= 8.04

Cost for Heat Pump Repair:

* Assume: 25% Broken Compressors
55% " Relays
10% " Water Pump
10% " T-Stat

∴ Avg. Repair Cost =

$0.25(435) + 0.55(125) + 0.10(330) + 0.10(110)$

$= \$271.50$ SAY \$270.00/unit

* approximate percentages found in Project 'Schofield - Repair Fedder's Heat Pump', Contract # DAHC 77-88-M-1191

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DATE: JOB No.:
PROJECT NAME: BY:
SUBJECT: Sht. 4-60 C Of

Labor Rate : \$22.00 + 80% LB = \$39.60

PROJECT ...epair Heat Pump							ESTIMATOR		CHECKED BY	SHEET OF	...TS
TASK DESCRIPTION ALL Units	QUANTITY		LABOR				EQUIPMENT		MATERIAL		TOTAL
	NO. OF UNITS	UNIT MEAS	MH/UNIT	TOTAL HRS	UNIT PRICE	COST	UNIT PRICE	COST	UNIT PRICE	COST	
Water Pump	1	EA	3	39.60	118.80	118.80			127	127.00	245.80
								Subtotal			245.80
								O/H (15%)			36.87
								Profit (10%)			28.27
								Tax (4%)			12.44
								Bond (1%)			3.23
								Total			326.60
								Say	\$	330.00	
Thermostat	1	EA	1	39.60	0.75	29.70			52	52.00	81.70
								Subtotal			81.70
								O/H (15%)			12.26
								Profit (10%)			9.40
								Tax (4%)			4.13
								Bond (1%)			1.07
								Total			108.57
								SAY		\$110.00	

DA FORM 5418-R, Apr 85 CONTD

Labor Rate : $22.00 + 80% CB = #[illegible].60

PROJ[illegible] Repair Heat Pump | ESTIMATOR | CHECKED BY | SHEET OF | [illegible]TS

TASK DESCRIPTION	QUANTITY		LABOR				EQUIPMENT		MATERIAL		TOTAL
	NO. OF UNITS	UNIT MEAS	MH/UNIT	TOTAL HRS	UNIT PRICE	COST	UNIT PRICE	COST	UNIT PRICE	COST	
ALL UNITS											
Compressor	1	EA		3	79.20	237.60			24l.00	241.00	478.60
								Subtotal			478.60
								O/H (15 %)			71.79
								Profit (10%)			55.04
								Tax (4%)			24.22
								Bond (1%)			6.30
								Total			635.94
								SAY		$635.00	
Time Delay Relay	1	EA	1	1	39.60	39.60			53.00	53.00	92.60
								Subtotal			92.60
								O/H (15 %)			13.89
								Profit (10%)			10.65
								Tax (4 %)			4.69
								Bond (1%)			1.22
								Total			123.04
								SAY	$	125.00	

Note : Material Costs from
Comfort ACR, Inc.
841-8447

DA FORM 5418-R, Apr 85 CONTD

4.8 Install Timeclocks

The existing hot water system for all unit types consists of a single storage type hot water heater w/ a heat pump. It is not recommended that a timeclock be used with a heat pump system.

4.9 Shutdown Energy to Hot Water Heater or Modify Controls

See Section 4.8

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DATE:
JOB No.:
PROJECT NAME:
BY:
SUBJECT:

5. Electrical Systems

5.1 Improve Power Factors

The power factor for Schofield Barracks has ranged between 90-93% over the past 2 years, averaging 91%. This is considered to be very good power factor and additional improvements to increase this factor is not recommended.

5.2 Transformer Overvoltage

Transformer overvoltage is not a desirable condition due to wear on equipment drawing electricity, but it does not cause increased energy usage.

5.3 Transformer Loading

The existing transformer capacities in the areas under consideration (Family Housing Areas A, D, E, F, I, J, & K-1) are proper for the loads expected in such an environment. Therefore, it would not be feasible to increase energy savings by reduction of transformer capacities.

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DATE:	JOB No.:
PROJECT NAME:	BY:
SUBJECT:	Sht. 5-1 Of

6. HVAC System

6.1 Economizer Cycles (DB)

Not applicable, none of the unit types have central air conditioning systems.

6.2 Radiator Controls

Not applicables, none of the unit types have central heating systems.

6.3 EM Controls

Not applicable, none of the unit types have central air conditioning or heating equipment.

6.4 Chiller Replacement

Not applicable, chillers are not utilized in any of the unit types

6.5 Chiller Controls

Not applicable, chillers are not utilized in any of the unit types.

6.6 Replace Absorption Chiller

Not applicable, chillers are not utilized in any of the unit types.

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DATE:	JOB No.:
PROJECT NAME:	BY:
SUBJECT:	Sht. 6-1 Of

6.7 Boiler Oxygen Trim Control (Fixed or Portable)

Not applicable, boilers are not utilized in any of the unit types.

6.8 Revise Boiler Controls

Not applicable, boilers are not utilized in any of the unit types.

6.9 Return Condensate

Not applicable, the units do not have central heating systems.

6.10 Insulate Steam & Condensate Lines

Not applicable, the units do not have steam or condensate lines.

6.11 Waste Heat Recovery

Not applicable, the units do not have central air conditioning systems.

6.12 Thermal Storage

Not applicable, the units do not have central air conditioning systems.

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Telephone (808) 847-6557 Telefax: (808) 847-6550

DATE:	JOB No.:
PROJECT NAME:	BY:
SUBJECT:	Sht. 6-2 Of

6.13 Steam Trap Inspection

Not applicable, the units do not have steam heating systems.

6.14 Revise or Repair Building HVAC Controls

Not applicable, the units do not have central HVAC systems.

6.15 Night Setback / Setup Thermostats

Not applicable, the units do not have central air conditioning systems.

6.16 Infrared Heaters

Not applicable, the units do not have heating systems.

6.17 Air Curtains

Not applicable, the units do not have central air conditioning systems.

EDRIC D. O. CHONG & ASSOCIATES, INC.
CONSULTING MECHANICAL & ELECTRICAL ENGINEERS
2130-E North King Street Honolulu, Hawaii 96819
Telephone (808) 847-6557 Telefax: (808) 847-6550

6.18 Prevent Air Stratification

Not applicable, the units do not have central air conditioning systems.

6.19 Reduce Air Flows

Not applicable, the units do not have central air conditioning systems.

EDRIC D. O. CHONG & ASSOCIATES, INC.
CONSULTING MECHANICAL & ELECTRICAL ENGINEERS
2130-E North King Street Honolulu, Hawaii 96819
Telephone (808) 847-6557 Telefax: (808) 847-6550

DATE: JOB No.:
PROJECT NAME: BY:
SUBJECT:

7 Motor / Equipment

7.1 High Efficiency Motor Replacement

Not applicable, the units do not have large equipment with replacable type motors.

EDRIC D. O. CHONG & ASSOCIATES, INC.
CONSULTING MECHANICAL & ELECTRICAL ENGINEERS
2130-E North King Street Honolulu, Hawaii 96819
Telephone (808) 847-6557 Telefax: (808) 847-6550

DATE:	JOB No.:
PROJECT NAME:	BY:
SUBJECT:	Sht. 7-1 Of

APPENDIX B-1

SUMMARY OF ECO'S

TA -1.1: ENERGY CONSERVATION OPPORTUNITIES FOR UNIT TYPE 20-II

	ANNUAL ELECTRICAL ENERGY SAVINGS MBTU/UNIT	ANNUAL COST SAVINGS/ UNIT	ESTIMATED CONSTRUCTION COST/UNIT	SIMPLE PAYBACK YEARS	SIR
1. Insulation					
1.1 Insulation of Roof, Walls, etc.	----	----	----	----	----
1.2 Insulation of Piping	0.0038/LF	$0.26/LF	$3.75/LF	14.4	0.81
2. Exterior Building Envelope					
2.1 Weather Stripping & Caulking	----	----	----	----	----
2.2 Vestibles	----	----	----	----	----
2.3 Loading Dock Seals	----	----	----	----	----
2.4 Reduction of Glass Area	----	----	----	----	----
2.5 Low Emissivity Windows	----	----	----	----	----
2.6 Water Spray Roof Cooling	----	----	----	----	----
2.7 Solar Film	----	----	----	----	----
3. Lighting					
3.1 Reduce Lighting Levels	----	----	----	----	----
3.2 Replace Incadescent Lights	4.403	$87.72	$501	5.7	2.04
3.3 Energy Conserving Fluorescent Light & Ballast	----	----	----	----	----
3.4 Replace Kitchen Light Fixtures	(Combined w/ 3.3)				
3.5 Use More Energy Efficient Lighting Source	(Combined w/ 3.2)				
3.6 Reflectors for Fluorescent Fixtures	----	----	----	----	----
3.7 Occupancy Sensors to Control Lighting	----	----	----	----	----
3.8 Separate Switches to Control Lighting	----	----	----	----	----
3.9 Reduce Street Lighting	----	----	----	----	----
4. Hot Water					
4.1 Control Hot Water Circulation Pump	----	----	----	----	----
4.2 Heat Reclaim from Family Housing Condenser...	----	----	----	----	----
4.3 Heat Reclaim from Hot Refrigerant Gas	----	----	----	----	----
4.4 Instantaneous Hot Water Heaters	5.810	$38.56	$1424	36.9	0.11
4.5 Decentralize Domestic Hot Water Heaters	(Combined w/ 4.3)				
4.6 Install Shower Flow Restrictors/ Limited Flow Showerheads	----	----	----	----	----
4.7 Repair Broken Domestic Hot Water Heat Pumps	40.239	$801.72	$270	0.34	9.65

4.8 Install Timeclocks	----	----	----	----	----
4.9 Shutdown Energy to Hot Water Heater or Modify Controls	----	----	----	----	----
5. Electrical System					
5.1 Improve Power Factor	----	----	----	----	----
5.2 Transformer Overvoltage	----	----	----	----	----
5.3 Transformer Loading	----	----	----	----	----
6. HVAC System					
6.1 Economizer Cycles (DB)	----	----	----	----	----
6.2 Radiator Controls	----	----	----	----	----
6.3 FM Radio Controls	----	----	----	----	----
6.4 Chiller Replacement	----	----	----	----	----
6.5 Chiller Controls	----	----	----	----	----
6.6 Replace Absorption Chiller	----	----	----	----	----
6.7 Boiler Oxygen Trim Control (Fixed or Portable)	----	----	----	----	----
6.8 Revise Boiler Controls	----	----	----	----	----
6.9 Insulate Steam & Condensate Lines	----	----	----	----	----
6.10 Waste Heat Recovery	----	----	----	----	----
6.11 Thermal Storage	----	----	----	----	----
6.12 Steam Trap Inspection	----	----	----	----	----
6.13 Revise or Repair Building HVAC Controls	----	----	----	----	----
6.14 Night Setback/Setup Thermostats	----	----	----	----	----
6.15 Infrared Heaters	----	----	----	----	----
6.16 Air Curtains	----	----	----	----	----
6.17 Prevent Air Stratification	----	----	----	----	----
6.18 Reduce Airflows	----	----	----	----	----
6.19 High Efficiency Motor Replacement	----	----	----	----	----
7. Motor/Equipment					
7.1 High Efficiency Motor Replacement	----	----	----	----	----

TA[illegible]-1.2: ENERGY CONSERVATION OPPORTUNITIES FOR UNIT TYPE 20-III

	ANNUAL ELECTRICAL ENERGY SAVINGS MBTU/UNIT	ANNUAL COST SAVINGS/ UNIT	ESTIMATED CONSTRUCTION COST/UNIT	SIMPLE PAYBACK YEARS	SIR
1. Insulation					
1.1 Insulation of Roof, Walls, etc.	----	----	----	----	----
1.2 Insulation of Piping	0.0038/LF	$0.26/LF	$3.75/LF	14.4	0.81
2. Exterior Building Envelope					
2.1 Weather Stripping & Caulking	----	----	----	----	----
2.2 Vestibles	----	----	----	----	----
2.3 Loading Dock Seals	----	----	----	----	----
2.4 Reduction of Glass Area	----	----	----	----	----
2.5 Low Emissivity Windows	----	----	----	----	----
2.6 Water Spray Roof Cooling	----	----	----	----	----
2.7 Solar Film	----	----	----	----	----
3. Lighting					
3.1 Reduce Lighting Levels	----	----	----	----	----
3.2 Replace Incadescent Lights	4.820	$95.95	$563.50	5.9	1.99
3.3 Energy Conserving Fluorescent Light & Ballast	----	----	----	----	----
3.4 Replace Kitchen Light Fixtures	(Combined w/ 3.3)				
3.5 Use More Energy Efficient Lighting Source	(Combined w/ 3.2)				
3.6 Reflectors for Fluorescent Fixtures	----	----	----	----	----
3.7 Occupancy Sensors to Control Lighting	----	----	----	----	----
3.8 Separate Switches to Control Lighting	----	----	----	----	----
3.9 Reduce Street Lighting	----	----	----	----	----
4. Hot Water					
4.1 Control Hot Water Circulation Pump	----	----	----	----	----
4.2 Heat Reclaim from Family Housing Condenser...	----	----	----	----	----
4.3 Heat Reclaim from Hot Refrigerant Gas	----	----	----	----	----
4.4 Instantaneous Hot Water Heaters	5.810	$38.56	$1424	36.9	0.11
4.5 Decentralize Domestic Hot Water Heaters	(Combined w/ 4.3)				
4.6 Install Shower Flow Restrictors/ Limited Flow Showerheads	----	----	----	----	----
4.7 Repair Broken Domestic Hot Water Heat Pumps	26.79	$533.66	$270	0.51	6.42

.8 Install Timeclocks	----	----	----	----	----
4.9 Shutdown Energy to Hot Water Heater or Modify Controls	----	----	----	----	----
5. Electrical System					
5.1 Improve Power Factor	----	----	----	----	----
5.2 Transformer Overvoltage	----	----	----	----	----
5.3 Transformer Loading	----	----	----	----	----
6. HVAC System					
6.1 Economizer Cycles (DB)	----	----	----	----	----
6.2 Radiator Controls	----	----	----	----	----
6.3 FM Radio Controls	----	----	----	----	----
6.4 Chiller Replacement	----	----	----	----	----
6.5 Chiller Controls	----	----	----	----	----
6.6 Replace Absorption Chiller	----	----	----	----	----
6.7 Boiler Oxygen Trim Control (Fixed or Portable)	----	----	----	----	----
6.8 Revise Boiler Controls	----	----	----	----	----
6.9 Insulate Steam & Condensate Lines	----	----	----	----	----
6.10 Waste Heat Recovery	----	----	----	----	----
6.11 Thermal Storage	----	----	----	----	----
6.12 Steam Trap Inspection	----	----	----	----	----
6.13 Revise or Repair Building HVAC Controls	----	----	----	----	----
6.14 Night Setback/Setup Thermostats	----	----	----	----	----
6.15 Infrared Heaters	----	----	----	----	----
6.16 Air Curtains	----	----	----	----	----
6.17 Prevent Air Stratification	----	----	----	----	----
6.18 Reduce Airflows	----	----	----	----	----
6.19 High Efficiency Motor Replacement	----	----	----	----	----
7. Motor/Equipment					
7.1 High Efficiency Motor Replacement	----	----	----	----	----

TA[illegible]-1.3: ENERGY CONSERVATION OPPORTUNITIES FOR UNIT TYPE 20-IV

	ANNUAL ELECTRICAL ENERGY SAVINGS MBTU/UNIT	ANNUAL COST SAVINGS/ UNIT	ESTIMATED CONSTRUCTION COST/UNIT	SIMPLE PAYBACK YEARS	SIR
1. Insulation					
1.1 Insulation of Roof, Walls, etc.	----	----	----	----	----
1.2 Insulation of Piping	0.0038/LF	$0.26/LF	$3.75/LF	14.4	0.81
2. Exterior Building Envelope					
2.1 Weather Stripping & Caulking	----	----	----	----	----
2.2 Vestibles	----	----	----	----	----
2.3 Loading Dock Seals	----	----	----	----	----
2.4 Reduction of Glass Area	----	----	----	----	----
2.5 Low Emissivity Windows	----	----	----	----	----
2.6 Water Spray Roof Cooling	----	----	----	----	----
2.7 Solar Film	----	----	----	----	----
3. Lighting					
3.1 Reduce Lighting Levels	----	----	----	----	----
3.2 Replace Incadescent Lights	6.000	$119.61	$623	5.2	2.24
3.3 Energy Conserving Fluorescent Light & Ballast	0.403	$ 8.02	$600.00	74.8	0.16
3.4 Replace Kitchen Light Fixtures	(Combined w/ 3.3)				
3.5 Use More Energy Efficient Lighting Source	(Combined w/ 3.2)				
3.6 Reflectors for Fluorescent Fixtures	----	----	----	----	----
3.7 Occupancy Sensors to Control Lighting	----	----	----	----	----
3.8 Separate Switches to Control Lighting	----	----	----	----	----
3.9 Reduce Street Lighting	----	----	----	----	----
4. Hot Water					
4.1 Control Hot Water Circulation Pump	----	----	----	----	----
4.2 Heat Reclaim from Family Housing Condenser...	----	----	----	----	----
4.3 Heat Reclaim from Hot Refrigerant Gas	----	----	----	----	----
4.4 Instantaneous Hot Water Heaters	5.810	$38.56	$1424	36.9	0.11
4.5 Decentralize Domestic Hot Water Heaters	(Combined w/ 4.3)				
4.6 Install Shower Flow Restrictors/ Limited Flow Showerheads	----	----	----	----	----
4.7 Repair Broken Domestic Hot Water Heat Pumps	40.239	$801.72	$270	0.34	9.65

4.8	Install Timeclocks	----	----	----	----	----
4.9	Shutdown Energy to Hot Water Heater or Modify Controls	----	----	----	----	----
5.	Electrical System					
5.1	Improve Power Factor	----	----	----	----	----
5.2	Transformer Overvoltage	----	----	----	----	----
5.3	Transformer Loading	----	----	----	----	----
6.	HVAC System					
6.1	Economizer Cycles (DB)	----	----	----	----	----
6.2	Radiator Controls	----	----	----	----	----
6.3	FM Radio Controls	----	----	----	----	----
6.4	Chiller Replacement	----	----	----	----	----
6.5	Chiller Controls	----	----	----	----	----
6.6	Replace Absorption Chiller	----	----	----	----	----
6.7	Boiler Oxygen Trim Control (Fixed or Portable)	----	----	----	----	----
6.8	Revise Boiler Controls	----	----	----	----	----
6.9	Insulate Steam & Condensate Lines	----	----	----	----	----
6.10	Waste Heat Recovery	----	----	----	----	----
6.11	Thermal Storage	----	----	----	----	----
6.12	Steam Trap Inspection	----	----	----	----	----
6.13	Revise or Repair Building HVAC Controls	----	----	----	----	----
6.14	Night Setback/Setup Thermostats	----	----	----	----	----
6.15	Infrared Heaters	----	----	----	----	----
6.16	Air Curtains	----	----	----	----	----
6.17	Prevent Air Stratification	----	----	----	----	----
6.18	Reduce Airflows	----	----	----	----	----
6.19	High Efficiency Motor Replacement	----	----	----	----	----
7.	Motor/Equipment					
7.1	High Efficiency Motor Replacement	----	----	----	----	----

TA[illegible]-1.4: ENERGY CONSERVATION OPPORTUNITIES FOR UNIT TYPE 20-V

	ANNUAL ELECTRICAL ENERGY SAVINGS MBTU/UNIT	ANNUAL COST SAVINGS/ UNIT	ESTIMATED CONSTRUCTION COST/UNIT	SIMPLE PAYBACK YEARS	SIR
1. Insulation					
1.1 Insulation of Roof, Walls, etc.	----	----	----	----	----
1.2 Insulation of Piping	0.0038/LF	$0.26/LF	$3.75/LF	14.4	0.81
2. Exterior Building Envelope					
2.1 Weather Stripping & Caulking	----	----	----	----	----
2.2 Vestibles	----	----	----	----	----
2.3 Loading Dock Seals	----	----	----	----	----
2.4 Reduction of Glass Area	----	----	----	----	----
2.5 Low Emissivity Windows	----	----	----	----	----
2.6 Water Spray Roof Cooling	----	----	----	----	----
2.7 Solar Film	----	----	----	----	----
3. Lighting					
3.1 Reduce Lighting Levels	----	----	----	----	----
3.2 Replace Incadescent Lights	4.287	$85.08	$476.00	5.6	2.08
3.3 Energy Conserving Fluorescent Light & Ballast	0.403	$ 8.02	$600.00	74.8	0.16
3.4 Replace Kitchen Light Fixtures	(Combined w/ 3.3)				
3.5 Use More Energy Efficient Lighting Source	(Combined w/ 3.2)				
3.6 Reflectors for Fluorescent Fixtures	----	----	----	----	----
3.7 Occupancy Sensors to Control Lighting	----	----	----	----	----
3.8 Separate Switches to Control Lighting	----	----	----	----	----
3.9 Reduce Street Lighting	----	----	----	----	----
4. Hot Water					
4.1 Control Hot Water Circulation Pump	----	----	----	----	----
4.2 Heat Reclaim from Family Housing Condenser...	----	----	----	----	----
4.3 Heat Reclaim from Hot Refrigerant Gas	----	----	----	----	----
4.4 Instantaneous Hot Water Heaters	5.810	$38.56	$1424	36.9	0.11
4.5 Decentralize Domestic Hot Water Heaters	(Combined w/ 4.3)				
4.6 Install Shower Flow Restrictors/ Limited Flow Showerheads	----	----	----	----	----
4.7 Repair Broken Domestic Hot Water Heat Pumps	20.058	$399.63	$270	0.68	4.81

.8	Install Timeclocks	----	----	----	----	----
4.9	Shutdown Energy to Hot Water Heater or Modify Controls	----	----	----	----	----
5.	Electrical System					
5.1	Improve Power Factor	----	----	----	----	----
5.2	Transformer Overvoltage	----	----	----	----	----
5.3	Transformer Loading	----	----	----	----	----
6.	HVAC System					
6.1	Economizer Cycles (DB)	----	----	----	----	----
6.2	Radiator Controls	----	----	----	----	----
6.3	FM Radio Controls	----	----	----	----	----
6.4	Chiller Replacement	----	----	----	----	----
6.5	Chiller Controls	----	----	----	----	----
6.6	Replace Absorption Chiller	----	----	----	----	----
6.7	Boiler Oxygen Trim Control (Fixed or Portable)	----	----	----	----	----
6.8	Revise Boiler Controls	----	----	----	----	----
6.9	Insulate Steam & Condensate Lines	----	----	----	----	----
6.10	Waste Heat Recovery	----	----	----	----	----
6.11	Thermal Storage	----	----	----	----	----
6.12	Steam Trap Inspection	----	----	----	----	----
6.13	Revise or Repair Building HVAC Controls	----	----	----	----	----
6.14	Night Setback/Setup Thermostats	----	----	----	----	----
6.15	Infrared Heaters	----	----	----	----	----
6.16	Air Curtains	----	----	----	----	----
6.17	Prevent Air Stratification	----	----	----	----	----
6.18	Reduce Airflows	----	----	----	----	----
6.19	High Efficiency Motor Replacement	----	----	----	----	----
7.	Motor/Equipment					
7.1	High Efficiency Motor Replacement	----	----	----	----	----

TA[illegible]-1.5: ENERGY CONSERVATION OPPORTUNITIES FOR UNIT TYPE 32-I & 32-I[illegible]

	ANNUAL ELECTRICAL ENERGY SAVINGS MBTU/UNIT	ANNUAL COST SAVINGS/ UNIT	ESTIMATED CONSTRUCTION COST/UNIT	SIMPLE PAYBACK YEARS	SIR
1. Insulation					
1.1 Insulation of Roof, Walls, etc.	----	----	----	----	----
1.2 Insulation of Piping	0.0038/LF	$0.26/LF	$3.75/LF	14.4	0.81
2. Exterior Building Envelope					
2.1 Weather Stripping & Caulking	----	----	----	----	----
2.2 Vestibles	----	----	----	----	----
2.3 Loading Dock Seals	----	----	----	----	----
2.4 Reduction of Glass Area	----	----	----	----	----
2.5 Low Emissivity Windows	----	----	----	----	----
2.6 Water Spray Roof Cooling	----	----	----	----	----
2.7 Solar Film	----	----	----	----	----
3. Lighting					
3.1 Reduce Lighting Levels	----	----	----	----	----
3.2 Replace Incadescent Lights	0.235	$ 4.69	$ 25.90	5.5	2.11
3.3 Energy Conserving Fluorescent Light & Ballast	1.010	$20.13	$1800.00	89.4	0.13
3.4 Replace Kitchen Light Fixtures	(Combined w/ 3.3)				
3.5 Use More Energy Efficient Lighting Source	(Combined w/ 3.2)				
3.6 Reflectors for Fluorescent Fixtures	----	----	----	----	----
3.7 Occupancy Sensors to Control Lighting	----	----	----	----	----
3.8 Separate Switches to Control Lighting	----	----	----	----	----
3.9 Reduce Street Lighting	----	----	----	----	----
4. Hot Water					
4.1 Control Hot Water Circulation Pump	----	----	----	----	----
4.2 Heat Reclaim from Family Housing Condenser...	----	----	----	----	----
4.3 Heat Reclaim from Hot Refrigerant Gas	----	----	----	----	----
4.4 Instantaneous Hot Water Heaters	5.810	$38.56	$1424	36.9	0.11
4.5 Decentralize Domestic Hot Water Heaters	(Combined w/ 4.3)				
4.6 Install Shower Flow Restrictors/ Limited Flow Showerheads	----	----	----	----	----
4.7 Repair Broken Domestic Hot Water Heat Pumps	20.058	$399.63	$270	0.68	4.81

.8	Install Timeclocks	----	----	----	----	----
4.9	Shutdown Energy to Hot Water Heater or Modify Controls	----	----	----	----	----
5.	Electrical System					
5.1	Improve Power Factor	----	----	----	----	----
5.2	Transformer Overvoltage	----	----	----	----	----
5.3	Transformer Loading	----	----	----	----	----
6.	HVAC System					
6.1	Economizer Cycles (DB)	----	----	----	----	----
6.2	Radiator Controls	----	----	----	----	----
6.3	FM Radio Controls	----	----	----	----	----
6.4	Chiller Replacement	----	----	----	----	----
6.5	Chiller Controls	----	----	----	----	----
6.6	Replace Absorption Chiller	----	----	----	----	----
6.7	Boiler Oxygen Trim Control (Fixed or Portable)	----	----	----	----	----
6.8	Revise Boiler Controls	----	----	----	----	----
6.9	Insulate Steam & Condensate Lines	----	----	----	----	----
6.10	Waste Heat Recovery	----	----	----	----	----
6.11	Thermal Storage	----	----	----	----	----
6.12	Steam Trap Inspection	----	----	----	----	----
6.13	Revise or Repair Building HVAC Controls	----	----	----	----	----
6.14	Night Setback/Setup Thermostats	----	----	----	----	----
6.15	Infrared Heaters	----	----	----	----	----
6.16	Air Curtains	----	----	----	----	----
6.17	Prevent Air Stratification	----	----	----	----	----
6.18	Reduce Airflows	----	----	----	----	----
6.19	High Efficiency Motor Replacement	----	----	----	----	----
7.	Motor/Equipment					
7.1	High Efficiency Motor Replacement	----	----	----	----	----

TA[illegible]B-1.6: ENERGY CONSERVATION OPPORTUNITIES FOR UNIT TYPE 32-III

		ANNUAL ELECTRICAL ENERGY SAVINGS MBTU/UNIT	ANNUAL COST SAVINGS/ UNIT	ESTIMATED CONSTRUCTION COST/UNIT	SIMPLE PAYBACK YEARS	SIR
1.	Insulation					
1.1	Insulation of Roof, Walls, etc.	----	----	----	----	----
1.2	Insulation of Piping	0.0038/LF	$0.26/LF	$3.75/LF	14.4	0.81
2.	Exterior Building Envelope					
2.1	Weather Stripping & Caulking	----	----	----	----	----
2.2	Vestibles	----	----	----	----	----
2.3	Loading Dock Seals	----	----	----	----	----
2.4	Reduction of Glass Area	----	----	----	----	----
2.5	Low Emissivity Windows	----	----	----	----	----
2.6	Water Spray Roof Cooling	----	----	----	----	----
2.7	Solar Film	----	----	----	----	----
3.	Lighting					
3.1	Reduce Lighting Levels	----	----	----	----	----
3.2	Replace Incadescent Lights	5.672	$113.00	$700.00	6.2	1.88
3.3	Energy Conserving Fluorescent Light & Ballast	----	----	----	----	----
3.4	Replace Kitchen Light Fixtures	(Combined w/ 3.3)				
3.5	Use More Energy Efficient Lighting Source	(Combined w/ 3.2)				
3.6	Reflectors for Fluorescent Fixtures	----	----	----	----	----
3.7	Occupancy Sensors to Control Lighting	----	----	----	----	----
3.8	Separate Switches to Control Lighting	----	----	----	----	----
3.9	Reduce Street Lighting	----	----	----	----	----
4.	Hot Water					
4.1	Control Hot Water Circulation Pump	----	----	----	----	----
4.2	Heat Reclaim from Family Housing Condenser...	----	----	----	----	----
4.3	Heat Reclaim from Hot Refrigerant Gas	----	----	----	----	----
4.4	Instantaneous Hot Water Heaters	5.810	$38.56	$1424	36.9	0.11
4.5	Decentralize Domestic Hot Water Heaters	(Combined w/ 4.3)				
4.6	Install Shower Flow Restrictors/ Limited Flow Showerheads	----	----	----	----	----
4.7	Repair Broken Domestic Hot Water Heat Pumps	20.058	$399.63	$270	0.68	4.81

8 Install Timeclocks	----	----	----	----	----
4.9 Shutdown Energy to Hot Water Heater or Modify Controls	----	----	----	----	----
5. Electrical System					
5.1 Improve Power Factor	----	----	----	----	----
5.2 Transformer Overvoltage	----	----	----	----	----
5.3 Transformer Loading	----	----	----	----	----
6. HVAC System					
6.1 Economizer Cycles (DB)	----	----	----	----	----
6.2 Radiator Controls	----	----	----	----	----
6.3 FM Radio Controls	----	----	----	----	----
6.4 Chiller Replacement	----	----	----	----	----
6.5 Chiller Controls	----	----	----	----	----
6.6 Replace Absorption Chiller	----	----	----	----	----
6.7 Boiler Oxygen Trim Control (Fixed or Portable)	----	----	----	----	----
6.8 Revise Boiler Controls	----	----	----	----	----
6.9 Insulate Steam & Condensate Lines	----	----	----	----	----
6.10 Waste Heat Recovery	----	----	----	----	----
6.11 Thermal Storage	----	----	----	----	----
6.12 Steam Trap Inspection	----	----	----	----	----
6.13 Revise or Repair Building HVAC Controls	----	----	----	----	----
6.14 Night Setback/Setup Thermostats	----	----	----	----	----
6.15 Infrared Heaters	----	----	----	----	----
6.16 Air Curtains	----	----	----	----	----
6.17 Prevent Air Stratification	----	----	----	----	----
6.18 Reduce Airflows	----	----	----	----	----
6.19 High Efficiency Motor Replacement	----	----	----	----	----
7. Motor/Equipment					
7.1 High Efficiency Motor Replacement	----	----	----	----	----

TA B-1.7: ENERGY CONSERVATION OPPORTUNITIES FOR UNIT TYPE 32-IV

	ANNUAL ELECTRICAL ENERGY SAVINGS MBTU/UNIT	ANNUAL COST SAVINGS/ UNIT	ESTIMATED CONSTRUCTION COST/UNIT	SIMPLE PAYBACK YEARS	SIR
1. Insulation					
1.1 Insulation of Roof, Walls, etc.	----	----	----	----	----
1.2 Insulation of Piping	0.0038/LF	$0.26/LF	$3.75/LF	14.4	0.81
2. Exterior Building Envelope					
2.1 Weather Stripping & Caulking	----	----	----	----	----
2.2 Vestibles	----	----	----	----	----
2.3 Loading Dock Seals	----	----	----	----	----
2.4 Reduction of Glass Area	----	----	----	----	----
2.5 Low Emissivity Windows	----	----	----	----	----
2.6 Water Spray Roof Cooling	----	----	----	----	----
2.7 Solar Film	----	----	----	----	----
3. Lighting					
3.1 Reduce Lighting Levels	----	----	----	----	----
3.2 Replace Incadescent Lights	5.041	$100.44	$661.50	6.6	1.77
3.3 Energy Conserving Fluorescent Light & Ballast	0.109	$ 2.18	$280.00	128.4	0.09
3.4 Replace Kitchen Light Fixtures	(Combined w/ 3.3)				
3.5 Use More Energy Efficient Lighting Source	(Combined w/ 3.2)				
3.6 Reflectors for Fluorescent Fixtures	----	----	----	----	----
3.7 Occupancy Sensors to Control Lighting	----	----	----	----	----
3.8 Separate Switches to Control Lighting	----	----	----	----	----
3.9 Reduce Street Lighting	----	----	----	----	----
4. Hot Water					
4.1 Control Hot Water Circulation Pump	----	----	----	----	----
4.2 Heat Reclaim from Family Housing Condenser...	----	----	----	----	----
4.3 Heat Reclaim from Hot Refrigerant Gas	----	----	----	----	----
4.4 Instantaneous Hot Water Heaters	5.810	$38.56	$1424	36.9	0.11
4.5 Decentralize Domestic Hot Water Heaters	(Combined w/ 4.3)				
4.6 Install Shower Flow Restrictors/ Limited Flow Showerheads	----	----	----	----	----
4.7 Repair Broken Domestic Hot Water Heat Pumps	33.512	$667.69	$270	0.40	8.04

4.8 Install Timeclocks	----	----	----	----	----
4.9 Shutdown Energy to Hot Water Heater or Modify Controls	----	----	----	----	----
5. Electrical System					
5.1 Improve Power Factor	----	----	----	----	----
5.2 Transformer Overvoltage	----	----	----	----	----
5.3 Transformer Loading	----	----	----	----	----
6. HVAC System					
6.1 Economizer Cycles (DB)	----	----	----	----	----
6.2 Radiator Controls	----	----	----	----	----
6.3 FM Radio Controls	----	----	----	----	----
6.4 Chiller Replacement	----	----	----	----	----
6.5 Chiller Controls	----	----	----	----	----
6.6 Replace Absorption Chiller	----	----	----	----	----
6.7 Boiler Oxygen Trim Control (Fixed or Portable)	----	----	----	----	----
6.8 Revise Boiler Controls	----	----	----	----	----
6.9 Insulate Steam & Condensate Lines	----	----	----	----	----
6.10 Waste Heat Recovery	----	----	----	----	----
6.11 Thermal Storage	----	----	----	----	----
6.12 Steam Trap Inspection	----	----	----	----	----
6.13 Revise or Repair Building HVAC Controls	----	----	----	----	----
6.14 Night Setback/Setup Thermostats	----	----	----	----	----
6.15 Infrared Heaters	----	----	----	----	----
6.16 Air Curtains	----	----	----	----	----
6.17 Prevent Air Stratification	----	----	----	----	----
6.18 Reduce Airflows	----	----	----	----	----
6.19 High Efficiency Motor Replacement	----	----	----	----	----
7. Motor/Equipment					
7.1 High Efficiency Motor Replacement	----	----	----	----	----

TA[illegible]B-1.8: ENERGY CONSERVATION OPPORTUNITIES FOR UNIT TYPE 57-I

	ANNUAL ELECTRICAL ENERGY SAVINGS MBTU/UNIT	ANNUAL COST SAVINGS/ UNIT	ESTIMATED CONSTRUCTION COST/UNIT	SIMPLE PAYBACK YEARS	SIR
1. Insulation					
1.1 Insulation of Roof, Walls, etc.	----	----	----	----	----
1.2 Insulation of Piping	0.0038/LF	$0.26/LF	$3.75/LF	14.4	0.81
2. Exterior Building Envelope					
2.1 Weather Stripping & Caulking	----	----	----	----	----
2.2 Vestibles	----	----	----	----	----
2.3 Loading Dock Seals	----	----	----	----	----
2.4 Reduction of Glass Area	----	----	----	----	----
2.5 Low Emissivity Windows	----	----	----	----	----
2.6 Water Spray Roof Cooling	----	----	----	----	----
2.7 Solar Film	----	----	----	----	----
3. Lighting					
3.1 Reduce Lighting Levels	----	----	----	----	----
3.2 Replace Incadescent Lights	4.212	$83.91	$451.50	5.4	2.17
3.3 Energy Conserving Fluorescent Light & Ballast	----	----	----	----	----
3.4 Replace Kitchen Light Fixtures	(Combined w/ 3.4)				
3.5 Use More Energy Efficient Lighting Source	(Combined w/ 3.2)				
3.6 Reflectors for Fluorescent Fixtures	----	----	----	----	----
3.7 Occupancy Sensors to Control Lighting	----	----	----	----	----
3.8 Separate Switches to Control Lighting	----	----	----	----	----
3.9 Reduce Street Lighting	----	----	----	----	----
4. Hot Water					
4.1 Control Hot Water Circulation Pump	----	----	----	----	----
4.2 Heat Reclaim from Family Housing Condenser...	----	----	----	----	----
4.3 Heat Reclaim from Hot Refrigerant Gas	----	----	----	----	----
4.4 Instantaneous Hot Water Heaters	5.810	$38.56	$1424	36.9	0.11
4.5 Decentralize Domestic Hot Water Heaters	(Combined w/ 4.3)				
4.6 Install Shower Flow Restrictors/ Limited Flow Showerheads	----	----	----	----	----
4.7 Repair Broken Domestic Hot Water Heat Pumps	13.331	$265.61	$270	1.0	3.20

4.8	Install Timeclocks	----	----	----	----	----
4.9	Shutdown Energy to Hot Water Heater or Modify Controls	----	----	----	----	----
5.	Electrical System					
5.1	Improve Power Factor	----	----	----	----	----
5.2	Transformer Overvoltage	----	----	----	----	----
5.3	Transformer Loading	----	----	----	----	----
6.	HVAC System					
6.1	Economizer Cycles (DB)	----	----	----	----	----
6.2	Radiator Controls	----	----	----	----	----
6.3	FM Radio Controls	----	----	----	----	----
6.4	Chiller Replacement	----	----	----	----	----
6.5	Chiller Controls	----	----	----	----	----
6.6	Replace Absorption Chiller	----	----	----	----	----
6.7	Boiler Oxygen Trim Control (Fixed or Portable)	----	----	----	----	----
6.8	Revise Boiler Controls	----	----	----	----	----
6.9	Insulate Steam & Condensate Lines	----	----	----	----	----
6.10	Waste Heat Recovery	----	----	----	----	----
6.11	Thermal Storage	----	----	----	----	----
6.12	Steam Trap Inspection	----	----	----	----	----
6.13	Revise or Repair Building HVAC Controls	----	----	----	----	----
6.14	Night Setback/Setup Thermostats	----	----	----	----	----
6.15	Infrared Heaters	----	----	----	----	----
6.16	Air Curtains	----	----	----	----	----
6.17	Prevent Air Stratification	----	----	----	----	----
6.18	Reduce Airflows	----	----	----	----	----
6.19	High Efficiency Motor Replacement	----	----	----	----	----
7.	Motor/Equipment					
7.1	High Efficiency Motor Replacement	----	----	----	----	----

TABLE B-1.9: ENERGY CONSERVATION OPPORTUNITIES FOR UNIT TYPE 57-II, 57-IV, 57-VI, 57-VIII, & 57-IX

		ANNUAL ELECTRICAL ENERGY SAVINGS MBTU/UNIT	ANNUAL COST SAVINGS/ UNIT	ESTIMATED CONSTRUCTION COST/UNIT	SIMPLE PAYBACK YEARS	SIR
1.	Insulation					
1.1	Insulation of Roof, Walls, etc.	----	----	----	----	----
1.2	Insulation of Piping	0.0038/LF	$0.26/LF	$3.75/LF	14.4	0.81
2.	Exterior Building Envelope					
2.1	Weather Stripping & Caulking	----	----	----	----	----
2.2	Vestibles	----	----	----	----	----
2.3	Loading Dock Seals	----	----	----	----	----
2.4	Reduction of Glass Area	----	----	----	----	----
2.5	Low Emissivity Windows	----	----	----	----	----
2.6	Water Spray Roof Cooling	----	----	----	----	----
2.7	Solar Film	----	----	----	----	----
3.	Lighting					
3.1	Reduce Lighting Levels	----	----	----	----	----
3.2	Replace Incadescent Lights	1.935	$38.56	$259.00	6.7	1.73
3.3	Energy Conserving Fluorescent Light & Ballast	----	----	----	----	----
3.4	Replace Kitchen Light Fixtures	(Combined w/ 3.3)				
3.5	Use More Energy Efficient Lighting Source	(Combined w/ 3.2)				
3.6	Reflectors for Fluorescent Fixtures	----	----	----	----	----
3.7	Occupancy Sensors to Control Lighting	----	----	----	----	----
3.8	Separate Switches to Control Lighting	----	----	----	----	----
3.9	Reduce Street Lighting	----	----	----	----	----
4.	Hot Water					
4.1	Control Hot Water Circulation Pump	----	----	----	----	----
4.2	Heat Reclaim from Family Housing Condenser...	----	----	----	----	----
4.3	Heat Reclaim from Hot Refrigerant Gas	----	----	----	----	----
4.4	Instantaneous Hot Water Heaters	5.810	$38.56	$1424	36.9	0.11
4.5	Decentralize Domestic Hot Water Heaters	(Combined w/ 4.3)				
4.6	Install Shower Flow Restrictors/ Limited Flow Showerheads	----	----	----	----	----
4.7	Repair Broken Domestic Hot Water Heat Pumps	26.785	$533.63	$270	0.51	6.43

.8	Install Timeclocks	----	----	----	----	----
4.9	Shutdown Energy to Hot Water Heater or Modify Controls	----	----	----	----	----
5.	Electrical System					
5.1	Improve Power Factor	----	----	----	----	----
5.2	Transformer Overvoltage	----	----	----	----	----
5.3	Transformer Loading	----	----	----	----	----
6.	HVAC System					
6.1	Economizer Cycles (DB)	----	----	----	----	----
6.2	Radiator Controls	----	----	----	----	----
6.3	FM Radio Controls	----	----	----	----	----
6.4	Chiller Replacement	----	----	----	----	----
6.5	Chiller Controls	----	----	----	----	----
6.6	Replace Absorption Chiller	----	----	----	----	----
6.7	Boiler Oxygen Trim Control (Fixed or Portable)	----	----	----	----	----
6.8	Revise Boiler Controls	----	----	----	----	----
6.9	Insulate Steam & Condensate Lines	----	----	----	----	----
6.10	Waste Heat Recovery	----	----	----	----	----
6.11	Thermal Storage	----	----	----	----	----
6.12	Steam Trap Inspection	----	----	----	----	----
6.13	Revise or Repair Building HVAC Controls	----	----	----	----	----
6.14	Night Setback/Setup Thermostats	----	----	----	----	----
6.15	Infrared Heaters	----	----	----	----	----
6.16	Air Curtains	----	----	----	----	----
6.17	Prevent Air Stratification	----	----	----	----	----
6.18	Reduce Airflows	----	----	----	----	----
6.19	High Efficiency Motor Replacement	----	----	----	----	----
7.	Motor/Equipment					
7.1	High Efficiency Motor Replacement	----	----	----	----	----

TABLE B-1.10: ENERGY CONSERVATION OPPORTUNITIES FOR UNIT TYPE 57-III

	ANNUAL ELECTRICAL ENERGY SAVINGS MBTU/UNIT	ANNUAL COST SAVINGS/ UNIT	ESTIMATED CONSTRUCTION COST/UNIT	SIMPLE PAYBACK YEARS	SIR
1. Insulation					
1.1 Insulation of Roof, Walls, etc.	----	----	----	----	----
1.2 Insulation of Piping	0.0038/LF	$0.26/LF	$3.75/LF	14.4	0.81
2. Exterior Building Envelope					
2.1 Weather Stripping & Caulking	----	----	----	----	----
2.2 Vestibles	----	----	----	----	----
2.3 Loading Dock Seals	----	----	----	----	----
2.4 Reduction of Glass Area	----	----	----	----	----
2.5 Low Emissivity Windows	----	----	----	----	----
2.6 Water Spray Roof Cooling	----	----	----	----	----
2.7 Solar Film	----	----	----	----	----
3. Lighting					
3.1 Reduce Lighting Levels	----	----	----	----	----
3.2 Replace Incadescent Lights	1.621	$32.30	$182.00	5.6	2.06
3.3 Energy Conserving Fluorescent Light & Ballast	0.239	$ 4.76	$610.00	128.2	0.09
3.4 Replace Kitchen Light Fixtures	(Combined w/ 3.3)				
3.5 Use More Energy Efficient Lighting Source	(Combined w/ 3.2)				
3.6 Reflectors for Fluorescent Fixtures	----	----	----	----	----
3.7 Occupancy Sensors to Control Lighting	----	----	----	----	----
3.8 Separate Switches to Control Lighting	----	----	----	----	----
3.9 Reduce Street Lighting	----	----	----	----	----
4. Hot Water					
4.1 Control Hot Water Circulation Pump	----	----	----	----	----
4.2 Heat Reclaim from Family Housing Condenser...	----	----	----	----	----
4.3 Heat Reclaim from Hot Refrigerant Gas	----	----	----	----	----
4.4 Instantaneous Hot Water Heaters	5.810	$38.56	$1424	36.9	0.11
4.5 Decentralize Domestic Hot Water Heaters	(Combined w/ 4.3)				
4.6 Install Shower Flow Restrictors/ Limited Flow Showerheads	----	----	----	----	----
4.7 Repair Broken Domestic Hot Water Heat Pumps	26.785	$533.63	$270	0.51	6.43

.8	Install Timeclocks	----	----	----	----	----
4.9	Shutdown Energy to Hot Water Heater or Modify Controls	----	----	----	----	----
5.	Electrical System					
5.1	Improve Power Factor	----	----	----	----	----
5.2	Transformer Overvoltage	----	----	----	----	----
5.3	Transformer Loading	----	----	----	----	----
6.	HVAC System					
6.1	Economizer Cycles (DB)	----	----	----	----	----
6.2	Radiator Controls	----	----	----	----	----
6.3	FM Radio Controls	----	----	----	----	----
6.4	Chiller Replacement	----	----	----	----	----
6.5	Chiller Controls	----	----	----	----	----
6.6	Replace Absorption Chiller	----	----	----	----	----
6.7	Boiler Oxygen Trim Control (Fixed or Portable)	----	----	----	----	----
6.8	Revise Boiler Controls	----	----	----	----	----
6.9	Insulate Steam & Condensate Lines	----	----	----	----	----
6.10	Waste Heat Recovery	----	----	----	----	----
6.11	Thermal Storage	----	----	----	----	----
6.12	Steam Trap Inspection	----	----	----	----	----
6.13	Revise or Repair Building HVAC Controls	----	----	----	----	----
6.14	Night Setback/Setup Thermostats	----	----	----	----	----
6.15	Infrared Heaters	----	----	----	----	----
6.16	Air Curtains	----	----	----	----	----
6.17	Prevent Air Stratification	----	----	----	----	----
6.18	Reduce Airflows	----	----	----	----	----
6.19	High Efficiency Motor Replacement	----	----	----	----	----
7.	Motor/Equipment					
7.1	High Efficiency Motor Replacement	----	----	----	----	----

TABLE B-1.11: ENERGY CONSERVATION OPPORTUNITIES FOR UNIT TYPE 57-V & 57-VII

	ANNUAL ELECTRICAL ENERGY SAVINGS MBTU/UNIT	ANNUAL COST SAVINGS/ UNIT	ESTIMATED CONSTRUCTION COST/UNIT	SIMPLE PAYBACK YEARS	SIR
1. Insulation					
1.1 Insulation of Roof, Walls, etc.	----	----	----	----	----
1.2 Insulation of Piping	0.0038/LF	$0.26/LF	$3.75/LF	14.4	0.81
2. Exterior Building Envelope					
2.1 Weather Stripping & Caulking	----	----	----	----	----
2.2 Vestibles	----	----	----	----	----
2.3 Loading Dock Seals	----	----	----	----	----
2.4 Reduction of Glass Area	----	----	----	----	----
2.5 Low Emissivity Windows	----	----	----	----	----
2.6 Water Spray Roof Cooling	----	----	----	----	----
2.7 Solar Film	----	----	----	----	----
3. Lighting					
3.1 Reduce Lighting Levels	----	----	----	----	----
3.2 Replace Incadescent Lights	1.464	$29.17	$154.00	5.3	2.20
3.3 Energy Conserving Fluorescent Light & Ballast	0.239	$ 4.76	$610.00	128.2	0.09
3.4 Replace Kitchen Light Fixtures	(Combined w/ 3.3)				
3.5 Use More Energy Efficient Lighting Source	(Combined w/ 3.2)				
3.6 Reflectors for Fluorescent Fixtures	----	----	----	----	----
3.7 Occupancy Sensors to Control Lighting	----	----	----	----	----
3.8 Separate Switches to Control Lighting	----	----	----	----	----
3.9 Reduce Street Lighting	----	----	----	----	----
4. Hot Water					
4.1 Control Hot Water Circulation Pump	----	----	----	----	----
4.2 Heat Reclaim from Family Housing Condenser...	----	----	----	----	----
4.3 Heat Reclaim from Hot Refrigerant Gas	----	----	----	----	----
4.4 Instantaneous Hot Water Heaters	5.810	$38.56	$1424	36.9	0.11
4.5 Decentralize Domestic Hot Water Heaters	(Combined w/ 4.3)				
4.6 Install Shower Flow Restrictors/ Limited Flow Showerheads	----	----	----	----	----
4.7 Repair Broken Domestic Hot Water Heat Pumps	20.058	$399.64	$270	0.68	4.81

.8	Install Timeclocks	----	----	----	----	----
4.9	Shutdown Energy to Hot Water Heater or Modify Controls	----	----	----	----	----
5.	Electrical System					
5.1	Improve Power Factor	----	----	----	----	----
5.2	Transformer Overvoltage	----	----	----	----	----
5.3	Transformer Loading	----	----	----	----	----
6.	HVAC System					
6.1	Economizer Cycles (DB)	----	----	----	----	----
6.2	Radiator Controls	----	----	----	----	----
6.3	FM Radio Controls	----	----	----	----	----
6.4	Chiller Replacement	----	----	----	----	----
6.5	Chiller Controls	----	----	----	----	----
6.6	Replace Absorption Chiller	----	----	----	----	----
6.7	Boiler Oxygen Trim Control (Fixed or Portable)	----	----	----	----	----
6.8	Revise Boiler Controls	----	----	----	----	----
6.9	Insulate Steam & Condensate Lines	----	----	----	----	----
6.10	Waste Heat Recovery	----	----	----	----	----
6.11	Thermal Storage	----	----	----	----	----
6.12	Steam Trap Inspection	----	----	----	----	----
6.13	Revise or Repair Building HVAC Controls	----	----	----	----	----
6.14	Night Setback/Setup Thermostats	----	----	----	----	----
6.15	Infrared Heaters	----	----	----	----	----
6.16	Air Curtains	----	----	----	----	----
6.17	Prevent Air Stratification	----	----	----	----	----
6.18	Reduce Airflows	----	----	----	----	----
6.19	High Efficiency Motor Replacement	----	----	----	----	----
7.	Motor/Equipment					
7.1	High Efficiency Motor Replacement	----	----	----	----	----

TABLE B-1.12: ENERGY CONSERVATION OPPORTUNITIES FOR UNIT TYPE 60-I

	ANNUAL ELECTRICAL ENERGY SAVINGS MBTU/UNIT	ANNUAL COST SAVINGS/ UNIT	ESTIMATED CONSTRUCTION COST/UNIT	SIMPLE PAYBACK YEARS	SIR
1. Insulation					
1.1 Insulation of Roof, Walls, etc.	----	----	----	----	----
1.2 Insulation of Piping	0.0038/LF	$0.26/LF	$3.75/LF	14.4	0.81
2. Exterior Building Envelope					
2.1 Weather Stripping & Caulking	----	----	----	----	----
2.2 Vestibles	----	----	----	----	----
2.3 Loading Dock Seals	----	----	----	----	----
2.4 Reduction of Glass Area	----	----	----	----	----
2.5 Low Emissivity Windows	----	----	----	----	----
2.6 Water Spray Roof Cooling	----	----	----	----	----
2.7 Solar Film	----	----	----	----	----
3. Lighting					
3.1 Reduce Lighting Levels	----	----	----	----	----
3.2 Replace Incadescent Lights	0.235	$4.69	$ 25.90	5.5	2.11
3.3 Energy Conserving Fluorescent Light & Ballast	0.259	$5.17	$610.00	130.0	0.09
3.4 Replace Kitchen Light Fixtures	(Combined w/ 3.3)				
3.5 Use More Energy Efficient Lighting Source	(Combined w/ 3.2)				
3.6 Reflectors for Fluorescent Fixtures	----	----	----	----	----
3.7 Occupancy Sensors to Control Lighting	----	----	----	----	----
3.8 Separate Switches to Control Lighting	----	----	----	----	----
3.9 Reduce Street Lighting	----	----	----	----	----
4. Hot Water					
4.1 Control Hot Water Circulation Pump	----	----	----	----	----
4.2 Heat Reclaim from Family Housing Condenser...	----	----	----	----	----
4.3 Heat Reclaim from Hot Refrigerant Gas	----	----	----	----	----
4.4 Instantaneous Hot Water Heaters	5.810	$38.56	$1424	36.9	0.11
4.5 Decentralize Domestic Hot Water Heaters	(Combined w/ 4.3)				
4.6 Install Shower Flow Restrictors/ Limited Flow Showerheads	----	----	----	----	----
4.7 Repair Broken Domestic Hot Water Heat Pumps	20.058	$399.64	$270	0.68	4.81

.8	Install Timeclocks	----	----	----	----	----
4.9	Shutdown Energy to Hot Water Heater or Modify Controls	----	----	----	----	----
5.	**Electrical System**					
5.1	Improve Power Factor	----	----	----	----	----
5.2	Transformer Overvoltage	----	----	----	----	----
5.3	Transformer Loading	----	----	----	----	----
6.	**HVAC System**					
6.1	Economizer Cycles (DB)	----	----	----	----	----
6.2	Radiator Controls	----	----	----	----	----
6.3	FM Radio Controls	----	----	----	----	----
6.4	Chiller Replacement	----	----	----	----	----
6.5	Chiller Controls	----	----	----	----	----
6.6	Replace Absorption Chiller	----	----	----	----	----
6.7	Boiler Oxygen Trim Control (Fixed or Portable)	----	----	----	----	----
6.8	Revise Boiler Controls	----	----	----	----	----
6.9	Insulate Steam & Condensate Lines	----	----	----	----	----
6.10	Waste Heat Recovery	----	----	----	----	----
6.11	Thermal Storage	----	----	----	----	----
6.12	Steam Trap Inspection	----	----	----	----	----
6.13	Revise or Repair Building HVAC Controls	----	----	----	----	----
6.14	Night Setback/Setup Thermostats	----	----	----	----	----
6.15	Infrared Heaters	----	----	----	----	----
6.16	Air Curtains	----	----	----	----	----
6.17	Prevent Air Stratification	----	----	----	----	----
6.18	Reduce Airflows	----	----	----	----	----
6.19	High Efficiency Motor Replacement	----	----	----	----	----
7.	**Motor/Equipment**					
7.1	High Efficiency Motor Replacement	----	----	----	----	----

TABLE B-1.13: ENERGY CONSERVATION OPPORTUNITIES FOR UNIT TYPE 60-II

		ANNUAL ELECTRICAL ENERGY SAVINGS MBTU/UNIT	ANNUAL COST SAVINGS/ UNIT	ESTIMATED CONSTRUCTION COST/UNIT	SIMPLE PAYBACK YEARS	SIR
1.	Insulation					
1.1	Insulation of Roof, Walls, etc.	----	----	----	----	----
1.2	Insulation of Piping	0.0038/LF	$0.26/LF	$3.75/LF	14.4	0.81
2.	Exterior Building Envelope					
2.1	Weather Stripping & Caulking	----	----	----	----	----
2.2	Vestibles	----	----	----	----	----
2.3	Loading Dock Seals	----	----	----	----	----
2.4	Reduction of Glass Area	----	----	----	----	----
2.5	Low Emissivity Windows	----	----	----	----	----
2.6	Water Spray Roof Cooling	----	----	----	----	----
2.7	Solar Film	----	----	----	----	----
3.	Lighting					
3.1	Reduce Lighting Levels	----	----	----	----	----
3.2	Replace Incadescent Lights	0.235	$4.69	$ 25.90	5.5	2.11
3.3	Energy Conserving Fluorescent Light & Ballast	0.239	$4.76	$610.00	128.2	0.09
3.4	Replace Kitchen Light Fixtures	(Combined w/ 3.3)				
3.5	Use More Energy Efficient Lighting Source	(Combined w/ 3.2)				
3.6	Reflectors for Fluorescent Fixtures	----	----	----	----	----
3.7	Occupancy Sensors to Control Lighting	----	----	----	----	----
3.8	Separate Switches to Control Lighting	----	----	----	----	----
3.9	Reduce Street Lighting	----	----	----	----	----
4.	Hot Water					
4.1	Control Hot Water Circulation Pump	----	----	----	----	----
4.2	Heat Reclaim from Family Housing Condenser...	----	----	----	----	----
4.3	Heat Reclaim from Hot Refrigerant Gas	----	----	----	----	----
4.4	Instantaneous Hot Water Heaters	5.810	$38.56	$1424	36.9	0.11
4.5	Decentralize Domestic Hot Water Heaters	(Combined w/ 4.3)				
4.6	Install Shower Flow Restrictors/ Limited Flow Showerheads	----	----	----	----	----
4.7	Repair Broken Domestic Hot Water Heat Pumps	33.512	$667.69	$270	0.40	8.04

4.8	Install Timeclocks	----	----	----	----	----
4.9	Shutdown Energy to Hot Water Heater or Modify Controls	----	----	----	----	----
5.	Electrical System					
5.1	Improve Power Factor	----	----	----	----	----
5.2	Transformer Overvoltage	----	----	----	----	----
5.3	Transformer Loading	----	----	----	----	----
6.	HVAC System					
6.1	Economizer Cycles (DB)	----	----	----	----	----
6.2	Radiator Controls	----	----	----	----	----
6.3	FM Radio Controls	----	----	----	----	----
6.4	Chiller Replacement	----	----	----	----	----
6.5	Chiller Controls	----	----	----	----	----
6.6	Replace Absorption Chiller	----	----	----	----	----
6.7	Boiler Oxygen Trim Control (Fixed or Portable)	----	----	----	----	----
6.8	Revise Boiler Controls	----	----	----	----	----
6.9	Insulate Steam & Condensate Lines	----	----	----	----	----
6.10	Waste Heat Recovery	----	----	----	----	----
6.11	Thermal Storage	----	----	----	----	----
6.12	Steam Trap Inspection	----	----	----	----	----
6.13	Revise or Repair Building HVAC Controls	----	----	----	----	----
6.14	Night Setback/Setup Thermostats	----	----	----	----	----
6.15	Infrared Heaters	----	----	----	----	----
6.16	Air Curtains	----	----	----	----	----
6.17	Prevent Air Stratification	----	----	----	----	----
6.18	Reduce Airflows	----	----	----	----	----
6.19	High Efficiency Motor Replacement	----	----	----	----	----
7.	Motor/Equipment					
7.1	High Efficiency Motor Replacement	----	----	----	----	----

TABLE B-1.14: ENERGY CONSERVATION OPPORTUNITIES FOR UNIT TYPE 60-III

	ANNUAL ELECTRICAL ENERGY SAVINGS MBTU/UNIT	ANNUAL COST SAVINGS/ UNIT	ESTIMATED CONSTRUCTION COST/UNIT	SIMPLE PAYBACK YEARS	SIR
1. Insulation					
1.1 Insulation of Roof, Walls, etc.	----	----	----	----	----
1.2 Insulation of Piping	0.0038/LF	$0.26/LF	$3.75/LF	14.4	0.81
2. Exterior Building Envelope					
2.1 Weather Stripping & Caulking	----	----	----	----	----
2.2 Vestibles	----	----	----	----	----
2.3 Loading Dock Seals	----	----	----	----	----
2.4 Reduction of Glass Area	----	----	----	----	----
2.5 Low Emissivity Windows	----	----	----	----	----
2.6 Water Spray Roof Cooling	----	----	----	----	----
2.7 Solar Film	----	----	----	----	----
3. Lighting					
3.1 Reduce Lighting Levels	----	----	----	----	----
3.2 Replace Incadescent Lights	0.235	$4.69	$ 25.90	5.5	2.11
3.3 Energy Conserving Fluorescent Light & Ballast	0.130	$2.58	$330.00	127.9	0.09
3.4 Replace Kitchen Light Fixtures	(Combined w/ 3.3)				
3.5 Use More Energy Efficient Lighting Source	(Combined w/ 3.2)				
3.6 Reflectors for Fluorescent Fixtures	----	----	----	----	----
3.7 Occupancy Sensors to Control Lighting	----	----	----	----	----
3.8 Separate Switches to Control Lighting	----	----	----	----	----
3.9 Reduce Street Lighting	----	----	----	----	----
4. Hot Water					
4.1 Control Hot Water Circulation Pump	----	----	----	----	----
4.2 Heat Reclaim from Family Housing Condenser...	----	----	----	----	----
4.3 Heat Reclaim from Hot Refrigerant Gas	----	----	----	----	----
4.4 Instantaneous Hot Water Heaters	5.810	$38.56	$1424	36.9	0.11
4.5 Decentralize Domestic Hot Water Heaters	(Combined w/ 4.3)				
4.6 Install Shower Flow Restrictors/ Limited Flow Showerheads	----	----	----	----	----
4.7 Repair Broken Domestic Hot Water Heat Pumps	26.785	$533.66	$270	0.51	6.43

4.8	Install Timeclocks	----	----	----	----	----
4.9	Shutdown Energy to Hot Water Heater or Modify Controls	----	----	----	----	----
5.	Electrical System					
5.1	Improve Power Factor	----	----	----	----	----
5.2	Transformer Overvoltage	----	----	----	----	----
5.3	Transformer Loading	----	----	----	----	----
6.	HVAC System					
6.1	Economizer Cycles (DB)	----	----	----	----	----
6.2	Radiator Controls	----	----	----	----	----
6.3	FM Radio Controls	----	----	----	----	----
6.4	Chiller Replacement	----	----	----	----	----
6.5	Chiller Controls	----	----	----	----	----
6.6	Replace Absorption Chiller	----	----	----	----	----
6.7	Boiler Oxygen Trim Control (Fixed or Portable)	----	----	----	----	----
6.8	Revise Boiler Controls	----	----	----	----	----
6.9	Insulate Steam & Condensate Lines	----	----	----	----	----
6.10	Waste Heat Recovery	----	----	----	----	----
6.11	Thermal Storage	----	----	----	----	----
6.12	Steam Trap Inspection	----	----	----	----	----
6.13	Revise or Repair Building HVAC Controls	----	----	----	----	----
6.14	Night Setback/Setup Thermostats	----	----	----	----	----
6.15	Infrared Heaters	----	----	----	----	----
6.16	Air Curtains	----	----	----	----	----
6.17	Prevent Air Stratification	----	----	----	----	----
6.18	Reduce Airflows	----	----	----	----	----
6.19	High Efficiency Motor Replacement	----	----	----	----	----
7.	Motor/Equipment					
7.1	High Efficiency Motor Replacement	----	----	----	----	----

TABLE B-1.15: ENERGY CONSERVATION OPPORTUNITIES FOR UNIT TYPE 71-I

		ANNUAL ELECTRICAL ENERGY SAVINGS MBTU/UNIT	ANNUAL COST SAVINGS/ UNIT	ESTIMATED CONSTRUCTION COST/UNIT	SIMPLE PAYBACK YEARS	SIR
1.	Insulation					
1.1	Insulation of Roof, Walls, etc.	----	----	----	----	----
1.2	Insulation of Piping	0.0038/LF	$0.26/LF	$3.75/LF	14.4	0.81
2.	Exterior Building Envelope					
2.1	Weather Stripping & Caulking	----	----	----	----	----
2.2	Vestibles	----	----	----	----	----
2.3	Loading Dock Seals	----	----	----	----	----
2.4	Reduction of Glass Area	----	----	----	----	----
2.5	Low Emissivity Windows	----	----	----	----	----
2.6	Water Spray Roof Cooling	----	----	----	----	----
2.7	Solar Film	----	----	----	----	----
3.	Lighting					
3.1	Reduce Lighting Levels	----	----	----	----	----
3.2	Replace Incadescent Lights	0.314	$6.26	$ 25.90	4.1	2.81
3.3	Energy Conserving Fluorescent Light & Ballast	----	----	----	----	----
3.4	Replace Kitchen Light Fixtures	(Combined w/ 3.3)				
3.5	Use More Energy Efficient Lighting Source	(Combined w/ 3.2)				
3.6	Reflectors for Fluorescent Fixtures	----	----	----	----	----
3.7	Occupancy Sensors to Control Lighting	----	----	----	----	----
3.8	Separate Switches to Control Lighting	----	----	----	----	----
3.9	Reduce Street Lighting	----	----	----	----	----
4.	Hot Water					
4.1	Control Hot Water Circulation Pump	----	----	----	----	----
4.2	Heat Reclaim from Family Housing Condenser...	----	----	----	----	----
4.3	Heat Reclaim from Hot Refrigerant Gas	----	----	----	----	----
4.4	Instantaneous Hot Water Heaters	5.810	$38.56	$1424	36.9	0.11
4.5	Decentralize Domestic Hot Water Heaters	(Combined w/ 4.3)				
4.6	Install Shower Flow Restrictors/ Limited Flow Showerheads	----	----	----	----	----
4.7	Repair Broken Domestic Hot Water Heat Pumps	33.512	$667.69	$270	0.40	8.04

.8	Install Timeclocks	----	----	----	----	----
4.9	Shutdown Energy to Hot Water Heater or Modify Controls	----	----	----	----	----
5.	Electrical System					
5.1	Improve Power Factor	----	----	----	----	----
5.2	Transformer Overvoltage	----	----	----	----	----
5.3	Transformer Loading	----	----	----	----	----
6.	HVAC System					
6.1	Economizer Cycles (DB)	----	----	----	----	----
6.2	Radiator Controls	----	----	----	----	----
6.3	FM Radio Controls	----	----	----	----	----
6.4	Chiller Replacement	----	----	----	----	----
6.5	Chiller Controls	----	----	----	----	----
6.6	Replace Absorption Chiller	----	----	----	----	----
6.7	Boiler Oxygen Trim Control (Fixed or Portable)	----	----	----	----	----
6.8	Revise Boiler Controls	----	----	----	----	----
6.9	Insulate Steam & Condensate Lines	----	----	----	----	----
6.10	Waste Heat Recovery	----	----	----	----	----
6.11	Thermal Storage	----	----	----	----	----
6.12	Steam Trap Inspection	----	----	----	----	----
6.13	Revise or Repair Building HVAC Controls	----	----	----	----	----
6.14	Night Setback/Setup Thermostats	----	----	----	----	----
6.15	Infrared Heaters	----	----	----	----	----
6.16	Air Curtains	----	----	----	----	----
6.17	Prevent Air Stratification	----	----	----	----	----
6.18	Reduce Airflows	----	----	----	----	----
6.19	High Efficiency Motor Replacement	----	----	----	----	----
7.	Motor/Equipment					
7.1	High Efficiency Motor Replacement	----	----	----	----	----

APPENDIX B-2

RANKING OF FEASIBLE ECO'S

B-2.1: SUMMARY OF FEASIBLE ECO'S FOR UNIT TYPE 20-II

	ANNUAL ELECTRICAL ENERGY SAVINGS MBTU/UNIT	ANNUAL COST SAVINGS/ UNIT	ESTIMATED CONSTRUCTION COST/UNIT	SIMPLE PAYBACK YEARS	SIR
1. Repair Broken Domestic Hot Water Heat Pumps	40.239	$801.72	$270	0.34	9.65
2. Replace Incadescent Lights	4.403	$87.72	$501	5.7	2.04
3. Insulation of Piping	0.0038/LF	$0.26/LF	$3.75/LF	14.4	0.81
4. Instantaneous Hot Water Heaters	5.810	$38.56	$1424	36.9	0.11

B-2.2: SUMMARY OF FEASIBLE ENERGY CONSERVATION OPPORTUNITIES FO[illegible] TYPE 20-III

		ANNUAL ELECTRICAL ENERGY SAVINGS MBTU/UNIT	ANNUAL COST SAVINGS/ UNIT	ESTIMATED CONSTRUCTION COST/UNIT	SIMPLE PAYBACK YEARS	SIR
1.	Repair Broken Domestic Hot Water Heat Pumps	26.79	\$533.66	\$270	0.51	6.42
2.	Replace Incadescent Lights	4.820	\$95.96	\$563.50	5.9	1.99
3.	Insulation of Piping	0.0038/LF	\$0.26/LF	\$3.75/LF	14.4	0.81
4.	Instantaneous Hot Water Heaters	5.810	\$38.56	\$1424	36.9	0.11

B-2.3: SUMMARY OF FEASIBLE ENERGY CONSERVATION OPPORTUNITIES FO[illegible] TYPE 20-IV

		ANNUAL ELECTRICAL ENERGY SAVINGS MBTU/UNIT	ANNUAL COST SAVINGS/ UNIT	ESTIMATED CONSTRUCTION COST/UNIT	SIMPLE PAYBACK YEARS	SIR
1.	Repair Broken Domestic Hot Water Heat Pumps	40.239	$801.72	$270	0.34	9.65
2.	Replace Incadescent Lights	6.000	$119.61	$623	5.2	2.24
3.	Insulation of Piping	0.0038/LF	$0.26/LF	$3.75/LF	14.4	0.81
4.	Energy Conserving Fluorescent Light & Ballast	0.403	$ 8.02	$600	74.8	0.16
5.	Instantaneous Hot Water Heaters	5.810	$38.56	$1424	36.9	0.11

B-2.4: SUMMARY OF FEASIBLE ENERGY CONSERVATION OPPORTUNITIES FO[illegible] TYPE 20-V

		ANNUAL ELECTRICAL ENERGY SAVINGS MBTU/UNIT	ANNUAL COST SAVINGS/ UNIT	ESTIMATED CONSTRUCTION COST/UNIT	SIMPLE PAYBACK YEARS	SIR
1.	Repair Broken Domestic Hot Water Heat Pumps	20.058	$399.63	$270	0.68	4.81
2.	Replace Incandescent Lights	4.287	$85.08	$476	5.6	2.08
3.	Insulation of Piping	0.0038/LF	$0.26/LF	$3.75/LF	14.4	0.81
4.	Energy Conserving Fluorescent Light & Ballast	0.403	$ 8.02	$600	74.8	0.16
5.	Instantaneous Hot Water Heaters	5.810	$38.56	$1424	36.9	0.11

B-2.5: SUMMARY OF FEASIBLE ENERGY CONSERVATION OPPORTUNITIES F[illegible] TYPE 32-I & 32-II

		ANNUAL ELECTRICAL ENERGY SAVINGS MBTU/UNIT	ANNUAL COST SAVINGS/ UNIT	ESTIMATED CONSTRUCTION COST/UNIT	SIMPLE PAYBACK YEARS	SIR
1.	Repair Broken Domestic Hot Water Heat Pumps	20.058	$399.63	$270	0.68	4.81
2.	Replace Incandescent Lights	0.235	$ 4.69	$25.90	5.5	2.11
3.	Insulation of Piping	0.0038/LF	$0.26/LF	$3.75/LF	14.4	0.81
4.	Energy Conserving Fluorescent Light & Ballast	1.010	$20.13	$1800	89.4	0.13
5.	Instantaneous Hot Water Heaters	5.810	$38.56	$1424	36.9	0.11

B-2.6: SUMMARY OF FEASIBLE ENERGY CONSERVATION OPPORTUNITIES F[illegible] TYPE 32-III

		ANNUAL ELECTRICAL ENERGY SAVINGS MBTU/UNIT	ANNUAL COST SAVINGS/ UNIT	ESTIMATED CONSTRUCTION COST/UNIT	SIMPLE PAYBACK YEARS	SIR
1.	Repair Broken Domestic Hot Water Heat Pumps	20.058	$399.63	$270	0.68	4.81
2.	Replace Incadescent Lights	5.672	$113.00	$700	6.2	1.88
3.	Insulation of Piping	0.0038/LF	$0.26/LF	$3.75/LF	14.4	0.81
4.	Instantaneous Hot Water Heaters	5.810	$38.56	$1424	36.9	0.11

B-2.7: SUMMARY OF FEASIBLE ENERGY CONSERVATION OPPORTUNITIES FO[illegible] TYPE 32-IV

		ANNUAL ELECTRICAL ENERGY SAVINGS MBTU/UNIT	ANNUAL COST SAVINGS/ UNIT	ESTIMATED CONSTRUCTION COST/UNIT	SIMPLE PAYBACK YEARS	SIR
1.	Repair Broken Domestic Hot Water Heat Pumps	33.512	$667.69	$270	0.40	8.04
2.	Replace Incadescent Lights	5.041	$100.44	$661.50	6.6	1.77
3.	Insulation of Piping	0.0038/LF	$0.26/LF	$3.75/LF	14.4	0.81
4.	Instantaneous Hot Water Heaters	5.810	$38.56	$1424	36.9	0.11
5.	Energy Conserving Fluorescent Light & Ballast	0.109	$ 2.18	$280	128.4	0.09

E B-2.8: SUMMARY OF FEASIBLE ENERGY CONSERVATION OPPORTUNITIES F T TYPE 57-I

		ANNUAL ELECTRICAL ENERGY SAVINGS MBTU/UNIT	ANNUAL COST SAVINGS/ UNIT	ESTIMATED CONSTRUCTION COST/UNIT	SIMPLE PAYBACK YEARS	SIR
1.	Repair Broken Domestic Hot Water Heat Pumps	13.331	$265.61	$270	1.0	3.20
2.	Replace Incandescent Lights	4.212	$83.91	$451.50	5.4	2.17
3.	Insulation of Piping	0.0038/LF	$0.26/LF	$3.75/LF	14.4	0.81
4.	Instantaneous Hot Water Heaters	5.810	$38.56	$1424	36.9	0.11

E B-2.9: SUMMARY OF FEASIBLE ENERGY CONSERVATION OPPORTUNITIES [illegible]T TYPE 57-II, 57-IV, 57-VI, 57-VIII, & 57-IX

	ANNUAL ELECTRICAL ENERGY SAVINGS MBTU/UNIT	ANNUAL COST SAVINGS/ UNIT	ESTIMATED CONSTRUCTION COST/UNIT	SIMPLE PAYBACK YEARS	SIR
1. Repair Broken Domestic Hot Water Heat Pumps	26.785	$533.63	$270	0.51	6.43
2. Replace Incadescent Lights	1.935	$38.56	$259	6.7	1.73
3. Insulation of Piping	0.0038/LF	$0.26/LF	$3.75/LF	14.4	0.81
4. Instantaneous Hot Water Heaters	5.810	$38.56	$1424	36.9	0.11

E B-2.10: SUMMARY OF FEASIBLE ENERGY CONSERVATION OPPORTUNITIES IT TYPE 57-III

	ANNUAL ELECTRICAL ENERGY SAVINGS MBTU/UNIT	ANNUAL COST SAVINGS/ UNIT	ESTIMATED CONSTRUCTION COST/UNIT	SIMPLE PAYBACK YEARS	SIR
1. Repair Broken Domestic Hot Water Heat Pumps	26.785	$533.63	$270	0.51	6.43
2. Replace Incadescent Lights	1.621	$32.30	$182	5.6	2.06
3. Insulation of Piping	0.0038/LF	$0.26/LF	$3.75/LF	14.4	0.81
4. Instantaneous Hot Water Heaters	5.810	$38.56	$1424	36.9	0.11
5. Energy Conserving Fluorescent Light & Ballast	0.239	$ 4.76	$610	128.2	0.09

E B-2.11: SUMMARY OF FEASIBLE ENERGY CONSERVATION OPPORTUNITIES IT TYPE 57-V & 57-VII

		ANNUAL ELECTRICAL ENERGY SAVINGS MBTU/UNIT	ANNUAL COST SAVINGS/ UNIT	ESTIMATED CONSTRUCTION COST/UNIT	SIMPLE PAYBACK YEARS	SIR
1.	Repair Broken Domestic Hot Water Heat Pumps	20.058	$399.64	$270	0.68	4.81
2.	Replace Incandescent Lights	1.464	$29.17	$154	5.3	2.20
3.	Insulation of Piping	0.0038/LF	$0.26/LF	$3.75/LF	14.4	0.81
4.	Instantaneous Hot Water Heaters	5.810	$38.56	$1424	36.9	0.11
5.	Energy Conserving Fluorescent Light & Ballast	0.239	$ 4.76	$610	128.2	0.09

E B-2.12: SUMMARY OF FEASIBLE ENERGY CONSERVATION OPPORTUNITIES IT TYPE 60-I

		ANNUAL ELECTRICAL ENERGY SAVINGS MBTU/UNIT	ANNUAL COST SAVINGS/ UNIT	ESTIMATED CONSTRUCTION COST/UNIT	SIMPLE PAYBACK YEARS	SIR
1.	Repair Broken Domestic Hot Water Heat Pumps	20.058	$399.64	$270	0.68	4.81
2.	Replace Incandescent Lights	0.235	$4.69	$25.90	5.5	2.11
3.	Insulation of Piping	0.0038/LF	$0.26/LF	$3.75/LF	14.4	0.81
4.	Instantaneous Hot Water Heaters	5.810	$38.56	$1424	36.9	0.11
5.	Energy Conserving Fluorescent Light & Ballast	0.259	$5.17	$610	130.0	0.09

E B-2.13: SUMMARY OF FEASIBLE ENERGY CONSERVATION OPPORTUNITIES IT TYPE 60-II

		ANNUAL ELECTRICAL ENERGY SAVINGS MBTU/UNIT	TOTAL ANNUAL COST SAVINGS/ UNIT	ESTIMATED CONSTRUCTION COST/UNIT	SIMPLE PAYBACK YEARS	SIR
1.	Repair Broken Domestic Hot Water Heat Pumps	33.512	$667.69	$270	0.40	8.04
2.	Replace Incadescent Lights	0.235	$4.69	$25.90	5.5	2.11
3.	Insulation of Piping	0.0038/LF	$0.26/LF	$3.75/LF	14.4	0.81
4.	Instantaneous Hot Water Heaters	5.810	$38.56	$1424	36.9	0.11
5.	Energy Conserving Fluorescent Light & Ballast	0.239	$4.76	$610	128.2	0.09

E B-2.14: SUMMARY OF FEASIBLE ENERGY CONSERVATION OPPORTUNITIES IT TYPE 60-III

		ANNUAL ELECTRICAL ENERGY SAVINGS MBTU/UNIT	ANNUAL COST SAVINGS/ UNIT	ESTIMATED CONSTRUCTION COST/UNIT	SIMPLE PAYBACK YEARS	SIR
1.	Repair Broken Domestic Hot Water Heat Pumps	26.785	$533.66	$270	0.51	6.43
2.	Replace Incadescent Lights	0.235	$4.69	$25.90	5.5	2.11
3.	Insulation of Piping	0.0038/LF	$0.26/LF	$3.75/LF	14.4	0.81
4.	Instantaneous Hot Water Heaters	5.810	$38.56	$1424	36.9	0.11
5.	Energy Conserving Fluorescent Light & Ballast	0.130	$2.58	$330	127.9	0.09

E B-2.15: SUMMARY OF FEASIBLE ENERGY CONSERVATION OPPORTUNITIES IT TYPE 71-I

		ANNUAL ELECTRICAL ENERGY SAVINGS MBTU/UNIT	ANNUAL COST SAVINGS/ UNIT	ESTIMATED CONSTRUCTION COST/UNIT	SIMPLE PAYBACK YEARS	SIR
1.	Repair Broken Domestic Hot Water Heat Pumps	33.512	$667.69	$270	0.40	8.04
2.	Replace Incadescent Lights	0.314	$6.26	$25.90	4.1	2.81
3.	Insulation of Piping	0.0038/LF	$0.26/LF	$3.75/LF	14.4	0.81
4.	Instantaneous Hot Water Heaters	5.810	$38.56	$1424	36.9	0.11

APPENDIX C-1

SCOPE OF WORK

CEHND-ED-ME *
eptember 1989 *

* 11 September 1989 *
28 August 1989
CEPOD-ED-MI

* REVISED *
SCOPE OF WORK
FOR AN
ENERGY SAVINGS OPPORTUNITIES SURVEY (ESOS)
OF
SCHOFIELD BARRACKS FAMILY HOUSING
AREAS A, D, E, F, I, J, K-1

Performed as part of the
ENERGY ENGINEERING ANALYSIS PROGRAM (EEAP)

* 11 September 1989 *
28 August 1989

* REVISED *
GENERAL SCOPE OF WORK
FOR AN
ENERGY SAVINGS OPPORTUNITY SURVEY(ESOS)

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   7.5 Provide Programming or Implementation Documentation
   7.6 Submittals, Presentations and Reviews

ANNEXES

   A - GENERAL ENERGY CONSERVATION OPPORTUNITIES

   B - DETAILED SCOPE OF WORK

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   D - EXECUTIVE SUMMARY GUIDELINE

1. BRIEF DESCRIPTION OF WORK: The Contractor shall:

1.1 Review for general information the previously completed Energy Engineering Analysis Program (EEAP) study and any other energy studies which were performed at this installation.

1.2 Reevaluate selected projects and energy conservation opportunities (ECOs) from previous studies to determine their economic feasibility based on revised criteria, current site conditions and technical applicability.

1.3 Evaluate selected ECOs to determine their energy savings potential and economic feasibility.

1.4 Perform a limited site survey of selected buildings or areas to insure that any methods of energy conservation which are practical and have not been evaluated in any previous energy study have been considered and the results documented.

1.5 Provide complete programming or implementation documentation for all recommended ECOs.

1.6 Prepare a comprehensive report to document the work performed, results and recommendations.

2. GENERAL

2.1 This study is intended to reevaluate energy conservation projects from previous studies which have not been implemented nor programmed for implementation and to identify/consider specific ECOs in buildings and areas that may have been overlooked previously or recently identified.

2.2 The information and analysis outlined herein are considered to be minimum essentials for adequate performance of this study.

2.3 The Contractor shall ensure that all methods of energy conservation which will reduce the energy consumption of the installation in compliance with the Energy Resources Management Plan including those listed in Annexes A and B have been considered and documented. All methods of energy conservation which are reasonable and practical shall be considered, including improvements of operational methods and procedures as well as the physical facilities. All energy conservation

opportunities which produce energy or dollar savings shall be documented in this report. Any energy conservation opportunity considered infeasible shall also be documented in the report with reasons for elimination. A list of general energy conservation opportunities to be used when evaluating specific buildings or areas is included as Annex A to this scope. Each ECOs shall be considered, evaluated and documented in the report. The list is not intended to be restrictive but only to assure that basic and generally repetitive opportunities are addressed in the report. Some of the energy conservation opportunities in Annex A may not be applicable to the specific building or area at this installation. A statement to that effect is all that is required.

2.4 The study shall include the energy consuming buildings or areas listed in Annex B-1. The work in the areas may be reduced somewhat by building repetition.

2.5 The study shall consider the use of all energy sources. The energy sources may include electricity, natural gas, liquefied petroleum gas, bulk oil, other oil products, steam when procured, gasoline, coal, solar, etc.

2.6 The "Energy Conservation Investment Program (ECIP) Guidance", described in letter from CEHSC-FU, dated 25 April 1988 and revised by letter from CEHSC-FU-P, dated 15 June 1989, establishes criteria for ECIP projects and shall be used for performing the economic analyses of all ECOs and projects. Construction cost escalation for DD Form 1391 submission shall be calculated using the guidelines contained in AR 415-17 and the latest Tri-Service MCP Index. The Tri-Service MCP Index, when updated, is contained in the latest applicable edition of the Engineer Improvement Recommendation System (EIRS) bulletin.

2.7 Energy conservation opportunities determined to be technically and economically feasible shall be developed into projects acceptable to installation personnel. This may involve combining similar ECOs into larger packages which will qualify for ECIP or MCA funding, and determining, in coordination with installation personnel, the appropriate packaging and implementation approach for all feasible ECOs.

2.8 Projects which qualify for ECIP funding shall be identified, separately listed, and prioritized by the Savings to Investment Ratio (SIR).

2.9 All feasible non-ECIP projects shall be ranked in order of highest to lowest SIR.

2.10 *

3. PROJECT MANAGEMENT

3.1 Project Managers. The Contractor shall designate a project manager to serve as a point of contact and liaison for work required under this contract. Upon award of this contract, the individual shall be immediately designated in writing. The Contractor's designated project manager shall be approved by the Contracting Officer prior to commencement of work. This designated individual shall be responsible for coordination of work required under this contract. The Contracting Officer will designate a project manager to serve as the Government's point of contact and liaison for all work required under this contract. This individual will be the Government's representative.

3.2 Installation Assistance. The Commanding Officer at each installation will designate an individual who will serve as the point of contact for obtaining information and assisting in establishing contacts with the proper individuals and organizations as necessary to accomplish the work required under this contract.

3.3 Public Disclosures. The Contractor shall make no public announcements or disclosures relative to information contained or developed in this contract, except as authorized by the Contracting Officer.

3.4 Meetings. Meetings will be scheduled whenever requested by the Contractor or the Contracting Officer for the resolution of questions or problems encountered in the performance of the work. The Contractor and/or the designated representative(s) shall be required to attend and participate in all meetings pertinent to the work required under this contract as directed by the Contracting Officer. These meetings, if necessary, are in addition to the presentation and review conferences.

3.5 Site Visits, Inspections, and Investigations. The Contractor shall visit and inspect/investigate the site of the project as necessary and required during the preparation and accomplishment of the work.

3.6 Records

3.6.1 The Contractor shall provide a record of all significant conferences, meetings, discussions, verbal directions, telephone

conversations, etc., with Government representative(s) relative to this contract in which the Contractor and/or designated representative(s) thereof participated. These records shall be dated and shall identify the contract number, and modification number if applicable, participating personnel, subject discussed and conclusions reached. The Contractor shall forward to the Contracting Officer within ten calendar days, a reproducible copy of the records.

3.6.2 The Contractor shall provide a record of requests for and/or receipt of Government-furnished material, data, documents, information, etc., which if not furnished in a timely manner, would significantly impair the normal progression of the work under this contract. The records shall be dated and shall identify the contract number and modification number, if applicable. The Contractor shall forward to the Contracting Officer within ten calendar days, a reproducible copy of the record of request or receipt of material.

3.7 Interviews. The Contractor and the Government's representative shall conduct entry and exit interviews with the Directorates of Facilities Engineering and Oahu Consolidated Housing Office before starting work at the installation and after completion of the field work. The Government's representative shall schedule the interviews at least one week in advance.

3.7.1 Entry. The entry interview shall thoroughly brief and describe the intended procedures for the survey and shall be conducted prior to commencing work at the facility. As a minimum, the interview shall cover the following points:

a. Schedules.

b. Names of energy analysts who will be conducting the site survey.

c. Proposed working hours.

d. Support requirements from the Directorates of Facilities Engineering and Oahu Consolidated Housing Offices.

3.7.2 Exit. The exit interview shall include a thorough briefing describing the items surveyed and probable areas of energy conservation. The interview shall also solicit input and advice from the Directorates of Facilities Engineering and Oahu Consolidated Housing.Offices.

4. SERVICES AND MATERIALS. All services, materials (except those specifically enumerated to be furnished by the Government), plant, labor, superintendence and travel necessary to perform the work and render the data required under this contract are included in the lump sum price of the contract.

5. PROJECT DOCUMENTATION. All energy conservation opportunities which the Contractor has considered shall be included in one of the following categories and presented in the report as such:

5.1 ECIP Projects. To qualify as an ECIP project, an ECO, or several ECOs which have been combined, must have a construction cost estimate greater than $200,000, a Savings to Investment Ratio greater than one and a simple payback period of less than eight years. For ECAM and family housing projects, the $200,000 limitation may not apply. The Contractor shall check with the installation for guidance. The overall project and each discrete part of the project shall have a SIR greater than one. For all projects meeting the above criteria, complete programming documentation will be required. Programming documentation shall consist of a DD Form 1391, life cycle cost analysis summary sheet(s) (with necessary backup data to verify the numbers presented), and a project development brochure (PDB). A life cycle cost analysis summary sheet shall be developed for each ECO and for the overall project when more than one ECO is combined. For projects and ECOs reevaluated from the previous studies, the backup data shall consist of copies of the original calculations and analysis, with new pages revising the original calculations and analysis. In addition, the backup data shall include as much of the following as is available: the increment of work the project or ECO was developed under in the previous study, title(s) of the project(s), the energy to cost (E/C) ratio, the benefit to cost (B/C) ratio, the current working estimate (CWE), and the payback period. This information shall be included as part of the backup data. The purpose of this information is to provide a means to prevent duplication of projects in any future reports.

5.2 Non-ECIP Projects. Projects which normally do not meet ECIP criteria, but which have an overall SIR greater than one shall be documented. The life cycle cost analysis summary sheet shall be completed through and including line 6 for all projects or ECOs. Each shall be analyzed to determine if they are feasible even if they do not meet ECIP criteria. These ECOs or projects may not meet the nonenergy qualification test. For projects or ECOs which meet this criteria, the life cycle cost analysis summary sheet, completely filled out, with all the necessary backup data to verify the numbers presented, a complete description of

the project and the simple payback period shall be included in the report. Additionally, these projects shall have the necessary documentation prepared, in accordance with the requirements of the Government's representative, for one of the following categories:

a. Quick Return on Investment Program (QRIP). This program is for projects which have a total cost not over $100,000 and a simple payback period of two years or less.

b. OSD Productivity Investment Funding (OSD PIF). This program is for projects which have a total cost of more than $100,000 and a simple payback period of four years or less.

c. Productivity Enhancing Capital Investment Program (PECIP). This program is for projects which have a total cost of more than $100,000 and a simple payback period of four years or less. The above programs are all described in detail in AR 5-4, Change No. 1.

d. Regular Military Construction Army (MCA) Program. This program is for projects which have a total cost greater than $200,000 and a simple payback period of eight to twenty-five years. Projects or ECOs which qualify for this program shall be economically analyzed in accordance with the requirements for Special Directed Studies in Engineering Technical Letter (ETL) 1110-3-332.

e. Low Cost/No Cost Projects. These are projects which the Directorates of Facilities Engineering and Oahu Consolidated Housing Offices can perform using their resources.

5.3 Nonfeasible ECOs. All ECOs which the Contractor has considered but which are not feasible, shall be documented in the report with reasons and justifications showing why they were rejected.

6. DETAILED SCOPE OF WORK. The general Scope of Work is intended to apply to contract efforts for all Army installations included under this contract except as modified by the detailed Scope of Work for each individual installation. The detailed Scope of Work is contained in Annex B.

7. WORK TO BE ACCOMPLISHED.

7.1

7.2 *

7.3 Evaluate Selected ECOs. The Contractor shall analyze the ECOs listed in Annex A. These ECOs shall be analyzed in detail to determine * their feasibility. Savings to Investment Ratios shall be determined using * current ECIP guidance. The necessary data required for these projects may not be available, requiring the Contractor to visit the installation to obtain any necessary information. The Contractor shall provide all data and calculations needed to support the recommended ECO. All assumptions shall be clearly stated. Calculations shall be prepared showing how all numbers in the ECO were figured. Calculations shall be an orderly step-by-step progression from the first assumption to the final number. Descriptions of the products, manufacturers catalog cuts, pertinent drawings and sketches shall also be included. A life cycle cost analysis summary sheet shall be prepared for each ECO and included as part of the supporting data. For ECOs which would replace the existing heating, ventilating, and air conditioning (HVAC) system or significantly change it (such as converting a multizone system to a variable air volume (VAV system)) the Contractor is required to run a computer simulation to analyze the system and to determine the energy savings. This requirement to use computer modeling applies only to heated and air conditioned or air conditioned only buildings which exceed 8,000 square feet or heated only buildings in excess of 20,000 square feet. The computer program shall analyze the building on an hour-by-hour basis rather than the bin data method or bin data to simulate an hour-by-hour analysis. Unless the Building Loads Analysis and System Thermodynamic (BLAST) program is used, the Contractor shall submit a sample computer run with an explanation of all input and output data and a summary of program methodology and energy evaluation capabilities for approval by the Contracting Officer prior to use of the program for analysis. The computer program used must be comparable to the BLAST program.

7.4 Perform a Limited Site Survey. The Contractor shall conduct a limited site survey to evaluate the buildings or areas listed in Annex B. The list of ECOs in Annex A shall be used when evaluating these building or areas. This list is not intended to be restrictive but only to assure that these opportunities, as a minimum, are considered, discussed and documented in the report. The Contractor may be aware of other ECOs not included in Annex A that will produce energy, manpower or dollar savings. These should be evaluated the same as the other ECOs. Each of the items shall be considered and discussed in the report. Those items on the list which are not practical, have been previously accomplished, are inappropriate or can be eliminated from detailed analysis based on

preliminary analysis shall be listed in the report along with the reason for elimination from further analysis. All potential ECOs which are not eliminated by preliminary considerations shall be thoroughly documented and evaluated as to technical and economic feasibility. The Contractor shall obtain all the necessary data to evaluate the ECOs by conducting a site survey. However, the Contractor is encouraged to use any data that may have been documented in a previous study. The Contractor shall document his site survey on forms developed for the survey, or standard forms, and submit these completed forms as part of the report. All test and/or measurement equipment shall be properly calibrated prior to its use.

7.5 Provide Programming or Implementation Documentation. For projects or ECOs reevaluated or developed during this study, complete programming or implementation documentation shall be prepared by the Contractor.

7.5.1 Programming Documentation. For projects or ECOs which meet ECIP criteria and which the installation wants to submit as an ECIP project, complete programming documentation shall be prepared. Complete programming documentation consists of DD Form 1391, Project Development Brochure (PDB) and supporting data. These forms shall be separate from the narrative report. They shall be bound similarly to the final report in a manner which will facilitate repeated disassembly and reassembly.

7.5.1.1 Military Construction Project Data (DD Form 1391). These documents shall be prepared in accordance with AR 415-15 and the supplemental requirements in Annex C. A complete DD Form 1391 shall be prepared for each project. The form shall include a statement that the project results from an EEAP study. Documents shall be complete as required for submission to higher DA headquarters. These programming documents will require review and signatures by the proper installation personnel. All documents shall be completed except for the required signatures.

7.5.1.2 Project Development Brochure (PDB). Preparation of the PDB requires the Contractor to delineate the functional requirements of the project as related to the specific site. The Contractor shall prepare PDBs in accordance with AR 415-20 and TM 5-800-3. Most projects will not require all the forms and checklists included in the Technical Manual (TM). Only that information needed for the project shall be included. The PDB-I

format described in the TM shall be used for whatever information is needed.

7.5.2 Implementation Documentation. For feasible projects or ECOs which normally do not meet ECIP criteria, implementation documentation shall be prepared. Each feasible project or ECO shall be individually packaged and fully documented and included as a separate section in the volume containing the programming documentation. Each project or ECO shall have a complete description of the changes required, economic justifications, sketches, and other backup data included as a section in the report. The documentation required will be as determined by the Government's representative. Documentation required will be in the categories listed in paragraph 5.2. For the QRIP, OSD PIF and PECIP projects, documentation shall be prepared in accordance with the requirements of AR 5-4, Change No. 1. A sample implementation document, consisting of a DA Form 5108-R, sketches and manufacturers data and a life cycle cost analysis summary sheet shall be submitted for review and approval. This sample shall be submitted with the interim submittal. This sample shall be approved before any other implementation documents are prepared. To the degree possible, the project or ECO selected for the sample submission shall be typical of the majority of subsequent projects to be submitted. The sample shall consist of complete implementation documents with primary emphasis on format and manner of presentation rather than precise accuracy of cost estimates and energy savings data. For MCA projects the documentation required shall be in accordance with paragraph 7.5.1 except that the economic analysis required by ETL 1110-3-332 shall be included in lieu of the ECIP life cycle cost analysis. For low cost/no cost projects which the Directorate of Facilities Engineering and Oahu Consolidated Housing Office personnel can perform, the following information shall be provided:

a. Brief description of the project.

b. Brief description of the reasons for the modification.

c. Specific instructions for performing the modification.

d. Estimated dollar and energy savings per year.

e. Estimated manhours and labor and materials costs. Costs shall be calculated for the current calendar year and so marked. Manhours shall be listed by trade. For projects that would repair an existing system so that it will function properly, also include the estimated manhours by

trade and labor and material costs necessary to maintain the system in that condition. Some of the simple practical modifications may be developed on a per unit basis. An example of this type of modification would be the repair or replacement of steam traps on an as needed basis. As a rule, however, the Contractor should develop complete projects, if at all possible, rather than per unit modifications.

Separate sheets for each project showing the above information shall be prepared and included in the report.

7.6 Submittals, Presentations and Reviews. The work accomplished shall be fully documented by a comprehensive report. The report shall have a table of contents and be indexed. Tabs and dividers shall clearly and distinctly divide sections, subsections, and appendices. All pages shall be numbered. The Contractor shall give a formal presentation of all but the final submittal to installation, command, and other Government personnel. The Contractor shall prepare slides or view graphs showing the results of the study to date for his presentation. During the presentation, the personnel in attendance shall be given ample opportunity to ask questions and discuss any changes deemed necessary to the study. A review conference will be conducted the same day, following the presentation. Each comment presented at the review conference will be discussed and resolved or action items assigned. The Contractor shall provide the comments from all reviewers and written notification of the action taken on each comment to all reviewing agencies within three weeks after the review meeting. It is anticipated that each presentation and review conference will require approximately one working day. The presentation and review conferences will be at the installation on the date(s) agreeable to the Directorate of Facilities Engineering, Oahu Consolidated Housing Office, the Contractor and the Government's representative. The Contracting Officer may require a resubmittal of any document(s), if such document(s) are not approved because they are determined by the Contracting Officer to be inadequate for the intended purpose.

7.6.1 Interim Submittal. An interim report shall be submitted for review after completion of the field survey and an analysis has been performed on all of the ECOs. The report shall indicate the work which has been accomplished to date, illustrate the methods and justifications of the approaches taken and contain a plan of the work remaining to complete the study. Calculations showing energy and dollar savings and SIRs of all the ECOs shall be included. The simple payback period of all ECOs shall be calculated and shown in the report. The Contractor shall submit the Scope of Work and any modifications to the Scope of Work as

an appendix to the report. A narrative summary describing the work and results to date shall be a part of this submittal. During the review period, the Government's representative shall coordinate with the Directorate of Facilities Engineering and Oahu Consolidated Housing Office and provide the Contractor with direction for packaging or combining ECOs for programming purposes and also indicate the fiscal year for which the programming or implementation documentation shall be prepared. A sample implementation document (DA Form 5108-R, sketches and manufacturers data, life cycle cost analysis summary sheet and supporting data) for one project shall be submitted with this submittal for review and approval. The survey forms completed during this audit shall be submitted with this report. The survey forms only may be submitted in final form with this submittal. They should be clearly marked at the time of submis-sion that they are to be retained. They shall be bound in a standard three-ring binder which will allow repeated disassembly and reassembly of the material contained within.

7.6.2 Prefinal Submittal. The Contractor shall prepare and submit the prefinal report when all work under this contract is complete. The Contractor shall submit the Scope of Work for the installation studied and any modifications to the Scope of Work as an appendix to the submittal. The report shall contain a narrative summary of conclusions and recommendations, together with all raw and supporting data, methods used, and sources of information. The report shall integrate all aspects of the study. The report shall include an order of priority by SIR in which the recommended ECOs should be accomplished. The synergistic effects of all of the ECOs on one another shall have been determined and the results of the original calculations adjusted accordingly. Completed programming and implementation documents for all recommended projects shall be included. The programming and implementation documents shall be ready for review and signature by the installation commander. The prefinal report, separately bound Executive Summary and all appendices shall be bound in standard three-ring binders which will allow repeated disassembly and reassembly. The prefinal submittal shall be arranged to include (a) a separately bound Executive Summary to give a brief overview of what was accomplished and the results of this study using graphs, tables and charts as much as possible (See Annex D for minimum requirements), (b) the narrative report containing a copy of the Executive Summary at the beginning of the volume and describing in detail what was accomplished and the results of this study, (c) appendices to include the detailed calculations and all backup material and (d) the programming and implementa-tion documentation. A list of all projects and ECOs developed during this study shall be included in the Executive Summary and shall

include the following data from the life cycle cost analysis summary sheet: the cost (construction plus SIOH), the annual energy savings (type and amount), the annual dollar savings, the SIR, the simple payback period and the analysis date. For all programmed projects also include the year in which it is programmed and the programmed year cost.

7.6.3 Final Submittal. Any revisions or corrections resulting from comments made during the review of the prefinal report or during the presentation and review conference shall be incorporated into the final report. These revisions or corrections may be in the form of replacement pages, which may be inserted in the prefinal report, or complete new volumes. Pen and ink changes or errata sheets will not be acceptable. If replacement pages are to be issued, it shall be clearly stated with the prefinal submittal that the submitted documents will be changed only to comply with the comments made during the prefinal conference and that the volumes issued at the time of the prefinal submittal should be retained. Failure to do so will require resubmission of complete volumes. If new volumes are submitted, they shall be in standard three-ring binders and shall contain all the information presented in the prefinal report with any necessary changes made. Detailed instructions of what to do with the replacement pages should be securely attached to the replacement pages.

* REVISED *

ANNEX A

GENERAL ENERGY CONSERVATION OPPORTUNITIES

/ o Insulation (wall, roof, pipe, duct, etc.)

o Insulated glass or double glazed windows

o Weather stripping & caulking

o Insulated panels

o Solar films

o Vestibules

o Load dock seals

o Reduction of glass area

/ o Replace kitchen light fixtures

/ o Shutdown energy to hot water heaters or modify controls

/ o Energy conserving fluorescent lamps and ballast

/ o Reduce lighting levels

/ o Replace incandescent lighting

/ o Use more efficient lighting source

/ o Improve power factor

o High efficiency motor replacement

o Night setback/setup thermostats

o Infrared heaters

- o Economizer cycles (dry bulb)
- o Control hot water circulation pump
- o FM radio controls
- o Radiator controls
- o Decentralize domestic hot water heaters
- o Install shower flow restrictors or limited flow showerheads (2 to 3 GPM)
- o Heat reclaim from hot refrigerant gas
- o Reduce air flow
- o Prevent air stratification
- o Install time clocks
- o Boiler oxygen trim control (fixed or portable)
- o Revise boiler controls
- o Chiller replacement
- o Chiller controls
- o Replace absorption chiller
- o Reduce street lights
- o Insulate steam and condensate lines
- o Return condensate
- o Heat reclaim from family housing condenser units for preheating of domestic hot water
- o Domestic hot water heat pumps
- o Transformer overvoltage

- Transformer loading
- Revise or repair building HVAC controls
- Waste heat recovery
- Thermal storage
- Steam trap inspection
- / Instantaneous hot water heater
- Air curtains
- Occupancy sensors to control lighting or HVAC
- Reflectors for fluorescent fixtures
- Water spray roof cooling
- Photocells to control lighting
- Low emissivity windows
- / Separate switches to control lighting arrangements

ANNEX B

* 1. A general Energy Saving Opportunities Survey (ESOS) shall be conducted for Family Housing in Areas A, D, E, F, I, J,and K-1, at Schofield Barracks, Oahu, Hawaii. The survey consists of 444 Family Housing Units. The breakdown by Areas and Type of Quarters are shown at Annex B-1. The evaluation should include but not be limited to the energy conservation opportunities listed in Annex A.

2. Report submittals and reviews: Documents will be submitted in accordance with the following:

Submittal	Calendar Days After NTP	Govt Review Calendar Days	No. of Copies
a. Interim	120	30	11
b. Prefinal	195	30	11
c. Final	255	NA	12

3. Distribution of report: The contractor will make distribution of the interim, prefinal and final reports with a forwarding letter requesting that addressees review and return comments within the above specified Government review period to:

Commander
U.S. Army Engineer Division, Pacific Ocean
ATTN: CEPOD-ED-MI
Bldg 230
Fort Shafter, HI 96858-5440

a. Distribution as follows:

(1) Three (3) copies to: Commander
U.S. Army Support Command, Hawaii
ATTN: APZV-FEC (Mr. Date)
Fort Shafter, HI 96858-5000

(2) Three (3) copies to: Commander
U.S. Army Support Command, Hawaii
Hawaii ATTN: APZV-OH (Mr. Machado)
Fort Shafter, HI 96858-5000

(3) Two (2) copies to: Commander
U.S. Army Western Command
ATTN: APEN-IC (Mr. Slenkamp)
Fort Shafter, HI 96858-5100

(4) Three (3) copies to: Commander
U.S. Army Engineer Division,
Pacific Ocean
ATTN: CEPOD-ED-MI (Mr. Lindsey)
Bldg 230,
Fort Shafter, HI 96858-5440

b. One copy of the completed final report with a cover letter identifying the project shall be sent to:

Mobile District
CESAM-EN-CC
P.O. Box 2288
Mobile, AL 36693

c. One copy of the executive summary shall be sent to:

Commander
U.S. Army Corps of Engineers
ATTN: CEEC-EE (Mr. D. Beranek)
Washington, D.C. 20314-1000

4. PAYMENTS. Monthly payment shall be made on the Contractor's estimate of work accomplished upon submission on ENG Form 93, Payment Estimate-Contract Performance. This form shall include Contractor's certification that the payment estimate is correct and just, and the requested payment has not been received. In addition, with each certified payment request, the Contractor shall submit a concise progress report delineating work completed and problems encountered. The Contracting Office requires the Contractor billings be submitted to U.S. Army Engineer Division, Pacific Ocean, ATTN: CEPOD-ED-MI by the 15th of each month. Upon approval, payment shall be made of ninety (90) percent of the amount as determined above. Upon satisfactory completion of all work under this contract, the Contractor will be paid the unpaid balance of any money due including ten (10) percent retained in previous payments.

5. USE OF INFORMATION. The information developed, gathered, assembled

and reproduced by the Contractor or his Consultants, Sub-Contractors or their associates in fulfillment of the contract requirements as defined or related to the Scope of Work will become the complete property of the Government and will, therefore, not be used by the Contractor for any purpose at any time without the written consent of the Contracting Officer.

6. GOVERNMENT PROJECT MANAGER. The Government has designated a Project Manager (CEPOD-ED-MI) within POD who will serve as the main point of contact for the Contracting Officer: David Lindsey, telephone 438-6938. The Project Manager will serve as the designated Government Representative for the Contracting Officer.

7. OCFHO POINT OF CONTACT. The OCFHO, USASCH coordinator to serve as the point of contact and liaison for all work is: Mr. Harold Machado, telephone 655-8943, Building 690, Schofield Barracks, Hawaii. The OCFHO coordinator will be responsible for arranging clearance into the site for field investigation.

8. DFE POINT OF CONTACT. The DFE, USASCH coordinator to serve as the point of contact and liaison for all work is: Mr. James Date,, telephone 655-4954, Building 372, Schofield Barracks, Hawaii.

9. COORDINATION. During the prosecution of the work, close liaison shall be maintained with the CEPOD-ED-MI who will coordinate the work with other elements of DFE, OCFHO, USASCH, and WESTCOM. All correspondence and submittals will be coordinated through the CEPOD-ED-MI All routine correspondence concerning field information, access, interface with utilities, etc., will be made directly with the organizations involved. However, the CEPOD-ED-MI will be kept informed of all coordination being made. All required coordination of a special nature will be made through the designated Government Representative only. Under no circumstances will any information concerning any matters directly related to the criteria, scope, scheduling or progress of projects under this Scope of Work be divulged to any individual or organization without specific approval of the Contracting Officer or the designated Government Representative. All requests made by the Using Service and other agencies shall be referred to the designated Government Representative. Arrangements for visits to office of the Using Service, meetings, and coordination (other than routine) as required with other agencies will be made by the designated Government Representative upon request.

10. QUALITY REQUIREMENTS. The Contractor is responsible for the quality

of all work accomplished under this contract. The review and checking of documents by DFE, OCFHO, USASCH, and WESTCOM does not relieve the Contractor of any responsibility. If errors are discovered at a later date, the Contractor shall be required to make necessary changes or perform other corrective action. Completed work will be transmitted by a letter signed by a principal of the firm certifying that all information has been coordinated and is complete and correct.

11. REFERENCES/GOVERNMENT FURNISHED INFORMATION. The following references apply to energy considerations and will be furnished by the Government at the specific request of the Contractor on a case by case basis for the period of the contract:

* a. Energy Resources Management Plan

b. Engineer Technical Letters (ETLs) 1110-3-254, Use of Electric Power for Comfort Space Heating; 1110-3-282, Energy Conservation; and 1110-3-332, Economic Studies.

c U.S. Army Corps of Engineers, Architectural and Engineering Instructions Design Criteria, 13 March 1987.

d. Energy Conservation Investment Program (ECIP) Guidance, dated 25 *
April 1988 and 15 June 1989.

e. Technical Manual - TM 5-785, Engineering Weather Data, TM 5-800-2, General Criteria Preparation of Cost Estimates, and TM 5-800-3, Project Development Brochure.

f. AR 415-15, Military Construction Army (MCA) Program Development, AR 415-17, Cost Estimating for Military Programming, AR 415-20, Construction, Project Development and Design Approval, AR 415-28, Department of the Army Facility Classes and Construction Categories, AR 415-35 Construction, Minor Construction, AR 420-10, General Provisions, Organization, Functions, and Personnel, and AR 5-4, Change No. 1, Department of the Army Productivity Improvement Program and AR 11-27, Army Energy Program.

g. Engineer Improvement Recommendation System (EIRS) Bulletin 84-
* 01 and Tri-Service Military Construction Program (MCP) Index (Most current edition).

12. All ECIP projects will be based on the fiscal year established

subsequent to the Interim Review Conference for cost estimation, programming and implementation.

13. Thirty-five millimeter (35mm) color slides will be provided for ECIP projects reflecting existing conditions which can be used as supporting documentation for ECIP project approval.

14. A computer program titled Life Cycle Costing in Design (LCCID) is available from the Blast Support Office in Urbana, Illinois for a nominal fee. This computer program shall be used for performing the economic calculations for ECIP and non-ECIP ECOs. The Blast Support Office can be contacted at 144 Mechanical Engineering Building, 1206 West Green Street, Urbana, Illinois 61801. The telephone number is (217) 333-3977.

ANNEX B-1

BUILDING	TYPE	APARTMENT	BDRMS	STORIES	AREA
49	32-I	-	2	1	A
50	32-I	-	2	1	A
51	32-I	-	2	1	A
52	32-I	-	2	1	A
53	32-I	-	2	1	A
54	32-I	-	2	1	A
55	32-I	-	2	1	A
56	32-I	-	2	1	A
57	32-I	-	2	1	A
58	32-I	-	2	1	A
60	32-I	-	2	1	A
61	32-II	-	2	1	A
62	32-II	-	2	1	A
63	32-II	-	2	1	A
64	32-II	-	2	1	A
65	32-II	-	2	1	A
66	32-II	-	2	1	A
71	32-II	-	2	1	A
72	32-II	-	2	1	A
73	32-II	-	2	1	A
74	32-II	-	2	1	A
75	32-II	-	2	1	A
81	71-I	A,B	4	1	A
83	71-I	A,B	4	1	A
85	71-I	-	4	1	A
410	20-II	-	4	1	D
425	20-II	-	4	1	D
426	20-II	-	4	1	D
441	20-II	-	4	1	D
442	20-II	-	4	1	D
401	20-III	-	3	1	D
402	20-III	-	3	1	D
403	20-III	-	3	1	D
404	20-III	-	3	1	D
405	20-III	-	3	1	D
406	20-III	-	3	1	D
407	20-III	-	3	1	D
408	20-III	-	3	1	D
411	20-III	-	3	1	D
412	20-III	-	3	1	D
413	20-III	-	3	1	D
414	20-III	-	3	1	D
415	20-III	-	3	1	D
416	20-III	-	3	1	D
417	20-III	-	3	1	D
418	20-III	-	3	1	D

BUILDING	TYPE	APARTMENT	BDRMS	STORIES	AREA
419	20-III	-	3	1	D
420	20-III	-	3	1	D
421	20-III	-	3	1	D
422	20-III	-	3	1	D
423	20-III	-	3	1	D
424	20-III	-	3	1	D
427	20-III	-	3	1	D
428	20-III	-	3	1	D
429	20-III	-	3	1	D
430	20-III	-	3	1	D
431	20-III	-	3	1	D
432	20-III	-	3	1	D
433	20-III	-	3	1	D
434	20-III	-	3	1	D
435	20-III	-	3	1	D
436	20-III	-	3	1	D
437	20-III	-	3	1	D
438	20-III	-	3	1	D
439	20-III	-	3	1	D
440	20-III	-	3	1	D
443	20-III	-	3	1	D
444	20-III	-	3	1	D
445	20-III	-	3	1	D
446	20-III	-	3	1	D
447	20-III	-	3	1	D
448	20-III	-	3	1	D
409	57-I	A,B	2	1	D
510	20-II	-	4	1	E
525	20-II	-	4	1	E
526	20-II	-	4	1	E
542	20-II	-	4	1	E
501	20-III	-	3	1	E
502	20-III	-	3	1	E
503	20-III	-	3	1	E
504	20-III	-	3	1	E
505	20-III	-	3	1	E
506	20-III	-	3	1	E
507	20-III	-	3	1	E
508	20-III	-	3	1	E
511	20-III	-	3	1	E
512	20-III	-	3	1	E
513	20-III	-	3	1	E
514	20-III	-	3	1	E
515	20-III	-	3	1	E
516	20-III	-	3	1	E
517	20-III	-	3	1	E

BUILDING	TYPE	APARTMENT	BDRMS	STORIES	AREA
518	20-III	-	3	1	E
519	20-III	-	3	1	E
520	20-III	-	3	1	E
521	20-III	-	3	1	E
523	20-III	-	3	1	E
524	20-III	-	3	1	E
527	20-III	-	3	1	E
528	20-III	-	3	1	E
529	20-III	-	3	1	E
530	20-III	-	3	1	E
531	20-III	-	3	1	E
532	20-III	-	3	1	E
533	20-III	-	3	1	E
534	20-III	-	3	1	E
535	20-III	-	3	1	E
536	20-III	-	3	1	E
537	20-III	-	3	1	E
538	20-III	-	3	1	E
539	20-III	-	3	1	E
540	20-III	-	3	1	E
543	20-III	-	3	1	E
544	20-III	-	3	1	E
545	20-III	-	3	1	E
546	20-III	-	3	1	E
547	20-III	-	3	1	E
548	20-III	-	3	1	E
509	20-VI	-	5	1	E
601	32-III	-	3	1	F
603	32-III	-	3	1	F
605	32-III	-	3	1	F
607	32-III	-	3	1	F
609	32-III	-	3	1	F
611	32-III	-	3	1	F
613	32-III	-	3	1	F
614	32-III	-	3	1	F
615	32-III	-	3	1	F
616	32-III	-	3	1	F
617	32-III	-	3	1	F
618	32-III	-	3	1	F
619	32-III	-	3	1	F
621	32-III	-	3	1	F
622	32-III	-	3	1	F
623	32-III	-	3	1	F
624	32-III	-	3	1	F
625	32-III	-	3	1	F
626	32-III	-	3	1	F

BUILDING	TYPE	APARTMENT	BDRMS	STORIES	AREA
627	32-III	-	3	1	F
628	32-III	-	3	1	F
629	32-III	-	3	1	F
631	32-III	-	3	1	F
635	32-III	-	3	1	F
637	32-III	-	3	1	F
639	32-III	-	3	1	F
600	32-IV	-	4	1	F
602	32-IV	-	4	1	F
604	32-IV	-	4	1	F
606	32-IV	-	4	1	F
608	32-IV	-	4	1	F
610	32-IV	-	4	1	F
612	32-IV	-	4	1	F
620	32-IV	-	4	1	F
633	32-IV	-	4	1	F
701	20-II	-	4	1	I
712	20-II	-	4	1	I
713	20-II	-	4	1	I
734	20-II	-	4	1	I
735	20-II	-	4	1	I
702	20-III	-	3	1	I
703	20-III	-	3	1	I
704	20-III	-	3	1	I
705	20-III	-	3	1	I
706	20-III	-	3	1	I
707	20-III	-	3	1	I
708	20-III	-	3	1	I
709	20-III	-	3	1	I
710	20-III	-	3	1	I
711	20-III	-	3	1	I
714	20-III	-	3	1	I
715	20-III	-	3	1	I
716	20-III	-	3	1	I
717	20-III	-	3	1	I
718	20-III	-	3	1	I
719	20-III	-	3	1	I
720	20-III	-	3	1	I
721	20-III	-	3	1	I
722	20-III	-	3	1	I
723	20-III	-	3	1	I
724	20-III	-	3	1	I
725	20-III	-	3	1	I
726	20-III	-	3	1	I
727	20-III	-	3	1	I
728	20-III	-	3	1	I

BUILDING	TYPE	APARTMENT	BDRMS	STORIES	AREA
729	20-III	-	3	1	I
730	20-III	-	3	1	I
731	20-III	-	3	1	I
732	20-III	-	3	1	I
733	20-III	-	3	1	I
736	20-III	-	3	1	I
737	20-III	-	3	1	I
738	20-III	-	3	1	I
739	20-III	-	3	1	I
740	20-III	-	3	1	I
741	20-III	-	3	1	I
742	20-III	-	3	1	I
743	20-III	-	3	1	I
744	20-III	-	3	1	I
736	57-I	A,B	2	1	I
803	20-IV	-	3	1	J
804	20-IV	-	3	1	J
805	20-IV	-	3	1	J
806	20-IV	-	3	1	J
807	20-IV	-	3	1	J
808	20-IV	-	3	1	J
809	20-IV	-	3	1	J
816	20-IV	-	3	1	J
817	20-IV	-	3	1	J
818	20-IV	-	3	1	J
819	20-IV	-	3	1	J
820	20-IV	-	3	1	J
821	20-IV	-	3	1	J
822	20-IV	-	3	1	J
823	20-IV	-	3	1	J
824	20-IV	-	3	1	J
825	20-IV	-	3	1	J
826	20-IV	-	3	1	J
827	20-IV	-	3	1	J
828	20-IV	-	3	1	J
829	20-IV	-	3	1	J
836	20-IV	-	3	1	J
837	20-IV	-	3	1	J
838	20-IV	-	3	1	J
839	20-IV	-	3	1	J
840	20-IV	-	3	1	J
841	20-IV	-	3	1	J
842	20-IV	-	3	1	J
843	20-IV	-	3	1	J
810	20-V	A,B	2	1	J
811	20-V	A,B	2	1	J

BUILDING	TYPE	APARTMENT	BDRMS	STORIES	AREA
830	20-V	A,B	2	1	J
831	20-V	A,B	2	1	J
832	20-V	A,B	2	1	J
833	20-V	A,B	2	1	J
844	20-V	A,B	2	1	J
802	57-I	A,B	2	1	J
814	57-I	A,B	2	1	J
835	57-I	A,B	2	1	J
3401	57-II	A,B	3	2	K-1
3402	57-II	A,B	3	2	K-1
3405	57-II	A,B	3	2	K-1
3406	57-II	A,B	3	2	K-1
3410	57-II	A,B	3	2	K-1
3411	57-II	A,B	3	2	K-1
3413	57-II	A,B	3	2	K-1
3414	57-II	A,B	3	2	K-1
3415	57-II	A,B	3	2	K-1
3416	57-II	A,B	3	2	K-1
3417	57-II	A,B	3	2	K-1
3420	57-II	A,B	3	2	K-1
3421	57-II	A,B	3	2	K-1
3424	57-II	A,B	3	2	K-1
3426	57-II	A,B	3	2	K-1
3501	57-II	A,B	3	2	K-1
3502	57-II	A,B	3	2	K-1
3503	57-II	A,B	3	2	K-1
3505	57-II	A,B	3	2	K-1
3506	57-II	A,B	3	2	K-1
3509	57-II	A,B	3	2	K-1
3510	57-II	A,B	3	2	K-1
3512	57-II	A,B	3	2	K-1
3513	57-II	A,B	3	2	K-1
3514	57-II	A,B	3	2	K-1
3517	57-II	A,B	3	2	K-1
3520	57-II	A,B	3	2	K-1
3522	57-II	A,B	3	2	K-1
3523	57-II	A,B	3	2	K-1
3524	57-II	A,B	3	2	K-1
3601	57-II	A,B	3	2	K-1
3604	57-II	A,B	3	2	K-1
3613	57-II	A,B	3	2	K-1
3614	57-II	A,B	3	2	K-1
3403	57-III	A,B	3	1	K-1
3409	57-III	A,B	3	1	K-1
3418	57-III	A,B	3	1	K-1
3419	57-III	A,B	3	1	K-1

BUILDING	TYPE	APARTMENT	BDRMS	STORIES	AREA
3423	57-III	A,B	3	1	K-1
3508	57-III	A,B	3	1	K-1
3515	57-III	A,B	3	1	K-1
3518	57-III	A,B	3	1	K-1
3603	57-III	A,B	3	1	K-1
3611	57-III	A,B	3	1	K-1
3427	57-IV	A,B,C,D	3	2	K-1
3432	57-IV	A,B,C,D	3	2	K-1
3433	57-IV	B,C	3	2	K-1
3434	57-IV	B,C	3	2	K-1
3436	57-IV	B,C	3	2	K-1
3438	57-IV	B,C	3	2	K-1
3440	57-IV	B,C,D,E	3	2	K-1
3442	57-IV	B,C	3	2	K-1
3444	57-IV	A,B,C,D	3	2	K-1
3445	57-IV	B,C	3	2	K-1
3448	57-IV	B,C	3	2	K-1
3605	57-IV	B,C	3	2	K-1
3606	57-IV	A,B,C,D	3	2	K-1
3610	57-IV	A,B,C,D	3	2	K-1
3617	57-IV	B,C	3	2	K-1
3618	57-IV	B,C	3	2	K-1
3620	57-IV	B,C	3	2	K-1
3621	57-IV	A,B,C,D	3	2	K-1
3624	57-IV	B,C	3	2	K-1
3625	57-IV	B,C	3	2	K-1
3626	57-IV	B,C	3	2	K-1
3627	57-IV	B,C	3	2	K-1
3630	57-IV	B,C	3	2	K-1
3631	57-IV	B,C	3	2	K-1
3632	57-IV	B,C	3	2	K-1
3633	57-IV	B,C	3	2	K-1
3636	57-IV	B,C,D,E	3	2	K-1
3637	57-IV	B,C	3	2	K-1
3638	57-IV	B,C,D,E	3	2	K-1
3641	57-IV	B,C,D,E	3	2	K-1
3642	57-IV	B,C	3	2	K-1
3644	57-IV	B,C	3	2	K-1
3646	57-IV	B,C	3	2	K-1
3648	57-IV	B,C	3	2	K-1
3701	57-IV	B,C	3	2	K-1
3702	57-IV	B,C	3	2	K-1
3703	57-IV	B,C	3	2	K-1
3706	57-IV	B,C	3	2	K-1
3707	57-IV	B,C	3	2	K-1
3710	57-IV	B,C	3	2	K-1

BUILDING	TYPE	APARTMENT	BDRMS	STORIES	AREA
3711	57-IV	B,C	3	2	K-1
3716	57-IV	B,C	3	2	K-1
3717	57-IV	B,C	3	2	K-1
3721	57-IV	B,C	3	2	K-1
3722	57-IV	B,C	3	2	K-1
3801	57-IV	B,C	3	2	K-1
3802	57-IV	B,C	3	2	K-1
3803	57-IV	B,C	3	2	K-1
3805	57-IV	B,C,D,E	3	2	K-1
3806	57-IV	B,C	3	2	K-1
3809	57-IV	B,C	3	2	K-1
3810	57-IV	A,B,C,D	3	2	K-1
3812	57-IV	B,C	3	2	K-1
3814	57-IV	B,C	3	2	K-1
3815	57-IV	B,C	3	2	K-1
3817	57-IV	B,C	3	2	K-1
3903	57-IX	A,B,C,D	3	2	K-1
3908	57-IX	A,B,C,D	3	2	K-1
3909	57-IX	A,B,C,D	3	2	K-1
3910	57-IX	A,B,C,D	3	2	K-1
3427	57-V	E	2	1	K-1
3432	57-V	E	2	1	K-1
3433	57-V	A,D	2	1	K-1
3434	57-V	A,D	2	1	K-1
3436	57-V	A,D	2	1	K-1
3438	57-V	A,D	2	1	K-1
3440	57-V	A	2	1	K-1
3442	57-V	A,D	2	1	K-1
3444	57-V	E	2	1	K-1
3445	57-V	A,D	2	1	K-1
3448	57-V	A,D	2	1	K-1
3605	57-V	A,D	2	1	K-1
3606	57-V	E	2	1	K-1
3610	57-V	E	2	1	K-1
3617	57-V	A,D	2	1	K-1
3618	57-V	A,D	2	1	K-1
3620	57-V	A,D	2	1	K-1
3621	57-V	E	2	1	K-1
3624	57-V	A,D	2	1	K-1
3625	57-V	A,D	2	1	K-1
3626	57-V	A,D	2	1	K-1
3627	57-V	A,D	2	1	K-1
3630	57-V	A,D	2	1	K-1
3631	57-V	A,D	2	1	K-1
3632	57-V	A,D	2	1	K-1
3633	57-V	A,D	2	1	K-1

BUILDING	TYPE	APARTMENT	BDRMS	STORIES	AREA
3636	57-V	A	2	1	K-1
3637	57-V	A,D	2	1	K-1
3638	57-V	A	2	1	K-1
3641	57-V	A	2	1	K-1
3642	57-V	A,D	2	1	K-1
3644	57-V	A,D	2	1	K-1
3646	57-V	A,D	2	1	K-1
3648	57-V	A,D	2	1	K-1
3701	57-V	A,D	2	1	K-1
3702	57-V	A,D	2	1	K-1
3703	57-V	A,D	2	1	K-1
3706	57-V	A,D	2	1	K-1
3707	57-V	A,D	2	1	K-1
3710	57-V	A,D	2	1	K-1
3711	57-V	A,D	2	1	K-1
3716	57-V	A,D	2	1	K-1
3717	57-V	A,D	2	1	K-1
3721	57-V	A,D	2	1	K-1
3722	57-V	A,D	2	1	K-1
3801	57-V	A,D	2	1	K-1
3802	57-V	A,D	2	1	K-1
3803	57-V	A,D	2	1	K-1
3805	57-V	A	2	1	K-1
3806	57-V	A,D	2	1	K-1
3809	57-V	A,D	2	1	K-1
3810	57-V	E	2	1	K-1
3812	57-V	A,D	2	1	K-1
3814	57-V	A,D	2	1	K-1
3815	57-V	A,D	2	1	K-1
3817	57-V	A,D	2	1	K-1
3430	57-VI	A,B,C,D	3	2	K-1
3608	57-VI	A,B,C,D	3	2	K-1
3704	57-VI	A,B,C,D	3	2	K-1
3713	57-VI	A,B,C,D	3	2	K-1
3720	57-VI	A,B,C,D	3	2	K-1
3807	57-VI	A,B,C,D	3	2	K-1
3900	57-VII	A	2	1	K-1
3904	57-VII	A	2	1	K-1
3905	57-VII	E	2	1	K-1
3913	57-VII	A	2	1	K-1
3914	57-VII	E	2	1	K-1
3916	57-VII	A	2	1	K-1
3900	57-VIII	B,C,D,E	3	2	K-1
3904	57-VIII	B,C.D,E	3	2	K-1
3905	57-VIII	A,B,C,D	3	2	K-1
3913	57-VIII	B,C.D,E	3	2	K-1

BUILDING	TYPE	APARTMENT	BDRMS	STORIES	AREA
3914	57-VIII	A,B,C,D	3	2	K-1
3916	57-VIII	B,C.D,E	3	2	K-1
3917	60-I	A,B,C,D	2	2	K-1
3924	60-I	A,B,C,D	2	2	K-1
3934	60-I	A,B,C,D	2	2	K-1
3935	60-I	A,B,C,D	2	2	K-1
3941	60-I	A,B,C,D	2	2	K-1
3922	60-II	A,B,C,D	4	2	K-1
3933	60-II	A,B,C,D	4	2	K-1
3936	60-II	A,B,C,D	4	2	K-1
3939	60-II	A,B,C,D	4	2	K-1
3918	60-III	A,B,C,D	3	2	K-1
3919	60-III	A,B,C,D	3	2	K-1
3920	60-III	A,B,C,D	3	2	K-1
3921	60-III	A,B,C,D	3	2	K-1
3923	60-III	A,B,C,D	3	2	K-1
3925	60-III	A,B,C,D	3	2	K-1
3926	60-III	A,B,C,D	3	2	K-1
3927	60-III	A,B,C,D	3	2	K-1
3928	60-III	A,B,C,D	3	2	K-1
3929	60-III	A,B,C,D	3	2	K-1
3930	60-III	A,B,C,D	3	2	K-1
3931	60-III	A,B,C,D	3	2	K-1
3932	60-III	A,B,C,D	3	2	K-1
3937	60-III	A,B,C,D	3	2	K-1
3938	60-III	A,B,C,D	3	2	K-1
3940	60-III	A,B,C,D	3	2	K-1
3942	60-III	A,B,C,D	3	2	K-1
3943	60-III	A,B,C,D	3	2	K-1
3945	60-III	A,B,C,D	3	2	K-1

ANNEX C

REQUIRED DD FORM 1391 DATA

To facilitate ECIP project approval, the following supplemental data shall be provided:

a. In title block clearly identify projects as "ECIP."

b. Complete description of each item of work to be accomplished including quantity, square footage, etc.

c. A comprehensive list of buildings, zones, or areas including building numbers, square foot floor area, designated temporary or permanent, and usage (administration, patient treatment, etc.).

d. List references, and assumptions, and provide calculations to support dollar and energy savings, and indicate any added costs.

(1) If a specific building, zone, or area is used for sample calculations, identify building, zone or area, category, orientation, square footage, floor area, window and wall area for each exposure.

(2) Identify weather data source.

(3) Identify infiltration assumptions before and after improvements.

(4) Include source of expertise and demonstrate savings claimed. Identify any special or critical environmental conditions such as pressure relationships, exhaust or outside air quantities, temperatures, humidity, etc.

e. Claims for boiler efficiency improvements must identify data to support present properly adjusted boiler operation and future expected efficiency. If full replacement of boilers is indicated, explain rejection of alternatives such as replace burners, nonfunctioning controls, etc. Assessment of the complete existing installation is required to make accurate determinations of required retrofit actions.

f. Lighting retrofit projects must identify number and type of fixtures, and wattage of each fixture being deleted and installed. New

lighting shall be only of the level to meet current criteria. Lamp changes in existing fixtures is not considered an ECIP type project.

g. An ECIP life cycle cost analysis summary sheet as shown in the ECIP Guidance shall be provided for the complete project and for each discrete part included in the project. The SIR is applicable to all segments of the project. Supporting documentation consisting of basic engineering and economic calculations showing how savings were determined shall be included.

h. The DD Form 1391 face sheet shall include, for the complete project, the annual dollar and MBTU savings, SIR, simple amortization period and a statement attesting that all buildings and retrofit actions will be in active use throughout the amortization period.

i. The calendar year in which the cost was calculated shall be clearly shown on the DD Form 1391.

j. For each temporary building included in a project, separate documentation is required showing (1) a minimum 10-year continuing need, based on the installation's annual real property utilization survey, for active building retention after retrofit, (2) the specific retrofit action applicable and (3) an economic analysis supporting the specific retrofit.

k. Nonappropriated funded facilities will not be included in an ECIP project without an accompanying statement certifying that utility costs are not reimbursable.

l. Any requirements required by ECIP guidance dated 25 April 1988 and any revisions thereto. Note that unescalated costs/savings are to be used in the economic analyses.

m. The five digit category number for all ECIP projects except for Family Housing is 80000. The category code number for Family Housing projects is 71100.

ANNEX D

EXECUTIVE SUMMARY GUIDELINE

1. Introduction.

2. Building Data (types, number of similar buildings, sizes, etc.)

3. Present Energy Consumption.

   o Total Annual Energy Used.

   o Source Energy Consumption.

     Electricity - KWH, Dollars, BTU
     Fuel Oil - GALS, Dollars, BTU
     Natural Gas - THERMS, Dollars, BTU
     Propane - GALS, Dollars, BTU
     Other - QTY, Dollars, BTU

   o Energy Consumption of the buildings in this study as compared to the basewide consumption.

4. Historical Energy Consumption.

5. Reevaluated Projects Results.

6. Energy Conservation Analysis.

   o ECOs Investigated.

   o ECOs Recommended.

   o ECOs Rejected. (Provide economics or reasons)

   o ECIP Projects Developed. (Provide list)*

   o Non-ECIP Projects Developed. (Provide list)*

   o Operational or Policy Change Recommendations.

- Include the following data from the life cycle cost analysis summary sheet: the cost (construction plus SIOH), the annual energy savings (type and amount), the annual dollar savings, the SIR, the simple payback period and the analysis date. For all programmed projects also include the year in which it is programmed and the programmed year cost.

7. Energy and Cost Savings.

   o Total Potential Energy and Cost Savings.

   o Percentage of Energy Conserved.

   o Energy Use and Cost Before and After the Energy Conservation Opportunities are Implemented.

8. Energy Plan.

   o Project Breakouts with Total Cost and SIR.

   o Schedule of Energy Conservation Project Implementation

APPENDIX C-2

ELECTRICAL BILLS

-K1

ofield Barracks Family Housing Reimbursements

:h,CY : Aug-89 FY: 89

ublic Housing 1970 & After (Cat N)

Units Metered	Reading No.	KWH-Meas or Est.	Adj. Factor (Tot units/	Mtrd units)	Billing Qty (KWH)	KWH/ Unit
208	Estimate	269152	215	208	278210	1294
208	11	219600	300	208	316731	1056
497	16	761400	640	497	980475	1532

Total Cat (N) ******** 1575416 KWH X 0.06927 = $$$ 109129.07

ublic Housing 1950-1969 - (Cat X) - Schofield Barracks (Rate A-FDA)

	Units Metered	Reading No.	KWH-Meas or Est.	Adj. Factor	Billing Qty (KWH)	KWH/ Unit
Area	112	* 12	113680			1015
Area	320	18	412800			1290
Area	224	4	165600			739
+1	492	Estimate	519060			1055
Total	1148		1211140	2140 /1148	2257700	1055

Sub-total 1 Cat (X) : 2257700 KWH X 0.06927 = $$$ 156390.88
(Rate A-FDA)

ation	Units Metered	KWH/Unit (Est)	Billing Qty(KWH)	Rate A (FDA)	Cost($)
mano	32	1055	33760	0.06927	2338.56

Sub-total 2 Cat (X) : 33760 KWH, $ 2338.56

Total Cat (X) ******** 2291460 KWH, $ 158729.44

:her Public Housing (Cat Y)

1161 KWH/Unit (Est) X 281 Units = 326241 X Rate A (FDA) 0.06927 = $$$ 22598.71

ib-Standard Housing - KMC (Cat Z)

900 KWH/Unit (Est) X 6 Units = 5400 X Rate A (FDA) 0.07589 = $$$ 409.81

Total SB Family Housing	4198517	** $	290867.03
Total SB FH w/o KMC	4193117	** $	290457.22

Schofield Barracks Electric Meter Readings - Sheet 1

								(update every FY)	
Month,CY :	Sep-89	FY:	89	HECO fuel oil rate :	-0.02578		Rate A :	0.09210	
Read'g dte:				HELCO fuel oil rate :	-0.01845		Rate B :	0.09710	

Location	Reading No.	Meter No.	Present Reading	Previous Reading	Mult. Factor	Computed Consump. (KWH)	Interval Between Readings (Days)	KWH Per 30.4 Days	KWH Per 30.4 Days Last Month	diff (%)
100 Area Nr Bldg 111	1	2045	3281	2983	120	35760	28	38,825	28,424	36.6
300 Area Nr Bldg 321	2	8896	3205	1926	10	12790	28	13,886	12,046	15.3
1300 Area Nr Bldg 1320	3	6219	5117	4990	1800	228600	28	248,194	230,280	7.8
1400 Area Nr Bldg 1320	4	154	8959	8787	1200	206400	28	224,091	209,760	6.8
SB Substation-Ckt 20	5	900	0	0	2771	0	28	0	0	0.0
SB Substation-Ckt 21	6	651	981	504	2771	1321767	28	1,435,061	1,769,006	-18.9
SB Substation-Main	7	6184	8874	8555	32000	10208000	28	11,082,971	10,984,533	0.9
Solomon School	8	4729	8979	8821	160	25280	28	27,447	10,741	155.5
Solomon School	9	7529	3447	3373	40	2960	28	3,214	2,128	51.0
1300 Area Nr Bldg 1370	10	8897	6370	5330	10	10400	28	11,291	10,817	4.4
1900 Area Nr Bldg 1983	11	145	4223	4002	1200	265200	28	287,931	278,160	3.5
3000 Area Nr Bldg 3930	12	147	2230	2165	1200	78000	28	84,686	95,760	-11.6
Area I UH Welding Shop	13	1879	3818	2777	1	1041	28	1,130	1,078	4.8
Area I UH Welding Shop	14	3470	588	587	100	100	28	109	633	-82.8
[illegible]0 Area Nr Bldg T-822	15	6979	1637	1543	160	15040	28	16,329	15,808	3.3
[illegible]000 Area Nr Ofc Club	16	6218	8830	8314	1800	928800	28	1,008,411	964,440	4.6
Helemano Mil Res	17	8177	2984	2884	1000	100000	28	108,571	130,467	-16.8
3000 Area Nr Bldg 3611	18	6223	5308	4870	1200	525600	28	570,651	522,880	9.1
Commissary	19	1514	4271	4047	1200	268800	28	291,840	304,000	-4.0
First Hawaiian Bank	20	1545	6818	6630	40	7520	28	8,165	7,397	10.4
SB Sewage Trtmt Plant	21	7178	2097	1617	600	288000	28	312,686	173,280	80.5
WAFB Aviation Fac	22	4193	1889	1663	60	13560	28	14,722	18,696	-21.3
South Ramp WAFB	23	4734	95410	95354	1	56	28	61	171	-64.3
SFTS WAFB	24	807	7678	7208	80	37600	28	40,823	42,864	-4.8
SFTS WAFB	25	676	6176	5875	1	301	28	327	367	-10.9
Bldg 114 WAFB	26	3782	437	433	1	4	28	4	11	-63.6
Mauna Kapu	27	5041	6045	5407	1	638	26	746	1,388	-46.3
QUAD A	28	6971	10010	9258	240	180480	28	195,950	202,768	-3.4
QUAD A	29	8004	10207	9714	160	78880	28	85,641	80,053	7.0
Helemano, Bldg 300	30	2566	10008	9999	200	1800	28	1,954	2,027	-3.6
Kunia Tunnel	31	6611	1490	1200	4000	1160000	28	1,259,429	1,226,133	2.7
Area X	32	4550	808	781	1200	32400	28	35,177	38,000	-7.4
Bldg T-300, WAFB	33	6093	2162	2153	120	1080	28	1,173	1,064	10.2
Bldg 1020,WAFB	34	8619	9641	9612	120	3480	28	3,778	3,496	8.1

Barracks Family Housing Reimbursements

: Sep-89 FY: 89

Housing 1970 & After (Cat N)

Units Metered	Reading No.	KWH-Meas or Est.	Adj. Factor (Tot units/	Mtrd units)	Billing Qty (KWH)	KWH/ Unit
208	Estimate	326976	215	208	337980	1572
208	11	265200	300	208	382500	1275
497	16	928800	640	497	1196040	1869

Total Cat (N) ******** 1916520 KWH X 0.06632 = $$$ 127103.61

Housing 1950-1969 - (Cat X) - Schofield Barracks

(Rate A-FOA)

Units Metered	Reading No.	KWH-Meas or Est.	Adj. Factor	Billing Qty (KWH)	KWH/ Unit
112	* 12	143584			1282
320	18	525600			1643
224	4	206400			921
492	Estimate	656688			1335
1148		1532272	2140 /1148	2856326	1335

Sub-total 1 Cat (X) : 2856326 KWH X 0.06632 = $$$ 189431.54
(Rate A-FOA)

Units Metered	KWH/Unit (Est)	Billing Qty(KWH)	Rate A (FOA)	Cost($)
32	1335	42720	0.06632	2833.19

Sub-total 2 Cat (X) : 42720 KWH, $ 2833.19

Total Cat (X) ******** 2899046 KWH, $ 192264.73

Public Housing (Cat Y)

1469 KWH/Unit (Est) X 281 Units = 412789 X Rate A (FOA) 0.06632 = $$$ 27376.17

andard Housing - KMC (Cat Z)

900 KWH/Unit (Est) X 6 Units = 5400 X Rate A (FOA) 0.07365 = $$$ 397.71

Total SB Family Housing	5233755	** $	347142.22
Total SB FH w/o KMC	5228355	** $	346744.51

A48-K101

Schofield Barracks Family Housing Reimbursements

Month,CY : Oct-89 FY: 90

1. Public Housing 1970 & After (Cat N)

	Units Metered	Reading No.	KWH-Meas or Est.	Adj. Factor (Tot units/Mtrd units)		Billing Qty (KWH)	KWH/ Unit
FY71	208	Estimate	428688	215	208	443115	2061
FY72	208	11	435600	300	208	628269	2094
FY73	497	16	1008000	640	497	1298028	2028

Total Cat (N) ******** 2369412 KWH X 0.06754 = $$$ 160030.09

2. Public Housing 1950-1969 - (Cat X) - Schofield Barracks (Rate A-FOA)

	Units Metered	Reading No.	KWH-Meas or Est.	Adj. Factor	Billing Qty (KWH)	KWH/ Unit
3000 Area	112	* 12	163856			1463
3000 Area	320	18	619200			1935
1400 Area	224	4	222000			991
1300+1400	492	Estimate	753792			1532
Sub-Total	1148		1758848	2140 /1148	3278689	1532

Sub-total 1 Cat (X) : 3278689 KWH X 0.06754 = $$$ 221442.66
(Rate A-FOA)

Location	Units Metered	KWH/Unit (Est)	Billing Qty(KWH)	Rate A (FOA)	Cost($)
Helemano	32	1532	49024	0.06754	3311.08

Sub-total 2 Cat (X) : 49024 KWH, $ 3311.08

Total Cat (X) ******** 3327713 KWH, $ 224753.74

4. Sub-St[illegible] Housing - KMC (Cat Z)

900 KWH/Unit (Est) X	6 Units =	5400	X Rate A (FOA)	0.07396	= $$$	399.38

Total SB Family Housing	6176010	** $	417162.39	
Total SB FH w/o KMC	6170610	** $	416763.01	ERR

AV1-BB40

Facilities Energy Consumption Report

Month,CY : Oct-89 FY: 90

Location		Energy Consumption MBTU(30.4 day)	
Ft. Shafter		6506	FS rdg 1,8
Aliamanu MR		18751	AMR bill & interval
Tripler AMC		8778	FSrdg 14,15
Kunia		5028	a-85,95,FS rdg 8 & QUAD A
Schofield Bks		32383	corrected for quad A
Others		3893	see below
	TOTAL	70311	Above - less kunia
Others Breakout			
Ft. DeRussy		910	FS rdg 26,29,30
SB STP		596	SB rdg 21
Helemano MR		390	SB rdg 17
Waiawa MR - sold to State of HI		0	not used
Ft. Kam		143	fixed estimate
Kapalama		704	FS rdg 19
KMC		367	HELCO bill
PTA		405	HELCO bill
Cannon Club		55	fixed estimate
Waianae ARC		108	bill A-25
Miscellaneous		215	List#2(SB+FS)-WARC-DDS-FR
	TOTAL	3893	-DMR+1600(DMR est)

family Housing	MBTU (30.4 Days)	unadjusted data KWH	cost

111.

A1-L46 ENTER MONTH (NUMERIC): 11 ENTER CY (NUMERIC,YY): 89 32813

Schofield Barracks Electric Meter Readings - Sheet 1

(update every FY)

Month,CY : Nov-89 FY: 1990 HECO fuel oil rate : -0.02661 Rate A : 0.09420 0.06759

Read'g dte: HELCO fuel oil rate : -0.01916 Rate B : 0.09926

Location	Reading No.	Meter No.	Present Reading	Previous Reading	Mult. Factor	Computed Consump. (KWH)	Interval Between Readings (Days)	KWH Per 30.4 Days	KWH Per 30.4 Days Last Month	diff (%)
100 Area Nr Bldg 111	1	2045	3707	3440	120	32040	34	28,648	17,577	63.0
300 Area Nr Bldg 321	2	8896	6539	4828	10	17110	34	15,298	14,951	2.3
1300 Area Nr Bldg 1320	3	6219	5380	5254	1800	226800	34	202,786	227,171	-10.7
1400 Area Nr Bldg 1320	4	154	9351	9144	1200	248400	34	222,099	204,509	8.6
SB Substation-Ckt 20	5	900	0	0	2771	0	34	0	0	0.0
SB Substation-Ckt 21	6	651	2015	1547	2771	1296828	34	1,159,517	1,444,816	-19.7
SB Substation-Main	7	6184	9621	9247	32000	11968000	34	10,700,800	10,995,588	-2.7
Solomon School	8	4729	9327	9173	160	24640	34	22,031	28,594	-23.0
Solomon School	9	7529	3622	3536	40	3440	34	3,076	3,280	-6.2
1300 Area Nr Bldg 1370	10	8897	8938	7654	10	12840	34	11,480	11,828	-2.9
1900 Area Nr Bldg 1983	11	145	4754	4586	1200	201600	34	180,254	401,280	-55.1
3000 Area Nr Bldg 3930	12	147	2428	2332	1200	115200	34	103,002	112,756	-8.7
Area I UH Welding Shop	13	1879	5488	4947	1	541	34	484	1,040	-53.5
Area I UH Welding Shop	14	3470	601	594	100	700	34	626	553	13.2
800 Area Nr Bldg T-822	15	6979	1868	1740	160	20480	34	18,312	15,182	20.6
9000 Area Nr Ofc Club	16	6218	9905	9390	1800	927000	34	828,847	928,582	-10.7
Helemano Mil Res	17	8177	3240	3108	1000	132000	34	118,024	114,230	3.3
3000 Area Nr Bldg 3611	18	6223	6365	5824	1200	649200	34	580,461	570,415	1.8
Commissary	19	1514	4813	4538	1200	330000	34	295,059	295,156	0.0
First Hawaiian Bank	20	1545	7226	7028	40	7920	34	7,081	7,738	-8.5
SB Sewage Trtmt Plant	21	7178	2853	2413	600	264000	34	236,047	174,662	35.1
WAFB Aviation Fac	22	4193	2504	2238	60	15960	34	14,270	19,290	-26.0
South Ramp WAFB	23	4734	95589	95502	1	87	34	78	85	-8.2
SFTS WAFB	24	807	8790	8245	80	43600	34	38,984	41,786	-6.7
SFTS WAFB	25	676	6942	6555	1	387	34	346	349	-0.9
Bldg 114 WAFB	26	3782	448	443	1	5	34	4	6	-33.3
Mauna Kapu	27	5041	7478	6791	1	687	34	614	687	-10.6
QUAD A	28	6971	1825	916	240	218160	34	195,061	200,308	-2.6
QUAD A	29	8004	1337	771	160	90560	34	80,971	83,130	-2.6

11/89

A48-K101

Schofield Barracks Family Housing Reimbursements

Month,CY : Nov-89 FY: 1990

1. Public Housing 1970 & After (Cat N)

	Units Metered	Reading No.	KWH-Meas or Est.	Adj. Factor (Tot units/Mtrd units)		Billing Qty (KWH)	KWH/ Unit
FY71	208	Estimate	294736	215	208	304655	1417
FY72	208	11	201600	300	208	290769	969
FY73	497	16	927000	640	497	1193722	1865

Total Cat (N) ******** 1789146 KWH X 0.06759 = $$$ 120928.38

2. Public Housing 1950-1969 - (Cat X) - Schofield Barracks (Rate A-FOA)

	Units Metered	Reading No.	KWH-Meas or Est.	Adj. Factor	Billing Qty (KWH)	KWH/ Unit
3000 Area	112	* 12	175728			1569
3000 Area	320	18	649200			2029
1400 Area	224	4	248400			1109
1300+1400	492	Estimate	804996			1636
Sub-Total	1148		1878324	2140 /1148	3501405	1636

Sub-total 1 Cat (X) : 3501405 KWH X 0.06759 = $$$ 236659.96
(Rate A-FOA)

Location	Units Metered	KWH/Unit (Est)	Billing Qty(KWH)	Rate A (FOA)	Cost($)

```
Helemano          32      1636     52352    0.06759    3538.47

                                         Sub-total 2 Cat (X)  :     52352  KWH,    $     3538.47

                                         Total Cat (X) ********   3553757  KWH,    $   240198.43
------------------------------------------------------------------------------------------------
3. Other Public Housing (Cat Y)

             1800  KWH/Unit   (Est) X         281  Units =       505800  X Rate A     0.06759   =  $$$     34187.02
                                                                              (FOA)
------------------------------------------------------------------------------------------------
4. Sub-Standard Housing - KMC (Cat Z)

              900  KWH/Unit   (Est) X           6  Units =         5400  X Rate A     0.07504   =  $$$       405.22
                                                                              (FOA)
================================================================================================
                                    Total SB Family Housing       5854103                          **  $    395719.05
                                    Total SB FH w/o KMC           5848703                          **  $    395313.83    ERR
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12/...

A1-L46 ENTER MONTH (NUMERIC): 12 ENTER CY (NUMERIC,YY): 89 32843

Schofield Barracks Electric Meter Readings - Sheet 1

(update every FY)

Month,CY : Dec-89 FY: 1990 HECO fuel oil rate : -0.02503 Rate A : 0.09420 .06917

Read'g dte: HELCO fuel oil rate : -0.01662 Rate B : 0.09926

Location	Reading No.	Meter No.	Present Reading	Previous Reading	Mult. Factor	Computed Consump. (KWH)	Interval Between Readings (Days)	KWH Per 30.4 Days	KWH Per 30.4 Days Last Month	diff (%)
100 Area Nr Bldg 111	1	2045	3954	3707	120	29640	29	31,071	28,648	8.5
300 Area Nr Bldg 321	2	8896	7997	6539	10	14580	29	15,284	15,298	-0.1
1300 Area Nr Bldg 1320	3	6219	5492	5380	1800	201600	29	211,332	202,786	4.2
1400 Area Nr Bldg 1320	4	154	9537	9351	1200	223200	29	233,975	222,099	5.3
SB Substation-Ckt 20	5	900	0	0	2771	0	29	0	0	0.0
SB Substation-Ckt 21	6	651	2564	2015	2771	1521279	29	1,594,720	1,159,517	37.5
SB Substation-Main	7	6184	9923	9621	32000	9664000	29	10,130,538	10,700,800	-5.3
Solomon School	8	4729	9412	9327	160	13600	29	14,257	22,031	-35.3
Solomon School	9	7529	3680	3622	40	2320	29	2,432	3,076	-20.9
1300 Area Nr Bldg 1370	10	8897	10011	8938	10	10730	29	11,248	11,480	-2.0
1900 Area Nr Bldg 1983	11	145	4984	4754	1200	276000	29	289,324	180,254	60.5
3000 Area Nr Bldg 3930	12	147	2515	2428	1200	104400	29	109,440	103,002	6.3
Area 1 UH Welding Shop	13	1879	6647	5488	1	1159	29	1,215	484	151.0
Area 1 UH Welding Shop	14	3470	604	601	100	300	29	314	626	-49.8
800 Area Nr Bldg T-822	15	6979	1980	1868	160	17920	29	18,785	18,312	2.6
9000 Area Nr Ofc Club	16	6218	10365	9905	1800	828000	29	867,972	828,847	4.7
Helemano Mil Res	17	8177	3349	3240	1000	109000	29	114,262	118,024	-3.2
3000 Area Nr Bldg 3611	18	6223	6848	6365	1200	579600	29	607,581	580,461	4.7
Commissary	19	1514	5041	4813	1200	273600	29	286,808	295,059	-2.8
First Hawaiian Bank	20	1545	7398	7226	40	6880	29	7,212	7,081	1.9
SB Sewage Trtmt Plant	21	7178	3230	2853	600	226200	29	237,120	236,047	0.5
WAFB Aviation Fac	22	4193	2695	2504	60	11460	29	12,013	14,270	-15.8
South Ramp WAFB	23	4734	95664	95589	1	75	29	79	78	1.3
SFTS WAFB	24	807	9214	8790	80	33920	29	35,558	38,984	-8.8
SFTS WAFB	25	676	7281	6942	1	339	29	355	346	2.6
Bldg 114 WAFB	26	3782	451	448	1	3	29	3	4	-25.0
Mauna Kapu	27	5041	8092	7478	1	614	29	644	614	4.9
QUAD A	28	6971	2586	1825	240	182640	29	191,457	195,061	-1.8
QUAD A	29	8004	1814	1337	160	76320	29	80,004	80,971	-1.2

12/89

A48-K101

Schofield Barracks Family Housing Reimbursements

Month,CY : Dec-89 FY: 1990

1. Public Housing 1970 & After (Cat N)

	Units Metered	Reading No.	KWH-Meas or Est.	Adj. Factor (Tot units/Mtrd units)		Billing Qty (KWH)	KWH/ Unit
FY71	208	Estimate	311376	215	208	321855	1497
FY72	208	11	276000	300	208	398077	1327
FY73	497	16	828000	640	497	1066237	1666

Total Cat (N) ******** 1786169 KWH X 0.06917 = $$$ 123549.31

2. Public Housing 1950-1969 - (Cat X) - Schofield Barracks (Rate A-FOA)

	Units Metered	Reading No.	KWH-Meas or Est.	Adj. Factor	Billing Qty (KWH)	KWH/ Unit
3000 Area	112	* 12	157248			1404
3000 Area	320	18	579600			1811
1400 Area	224	4	223200			996
1300+1400	492	Estimate	720036			1463
Sub-Total	1148		1680084	2140 /1148	3131864	1463

Sub-total 1 Cat (X) : 3131864 KWH X 0.06917 = $$$ 216631.03
(Rate A-FOA)

Sub-total 2 Cat (X) : 46816 KWH 3238.26

Total Cat (X) ******** 3178680 KWH, $ 219869.29

---

3. Other Public Housing (Cat Y)

1609	KWH/Unit	(Est) X	281	Units =	452129	X Rate A (FOA)	0.06917	= $$$ 31273.76

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4. Sub-Standard Housing - KMC (Cat Z)

900	KWH/Unit	(Est) X	6	Units =	5400	X Rate A (FOA)	0.07758	= $$$ 418.93

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Total SB Family Housing	5422378	** $	375111.29	
Total SB FH w/o KMC	5416978	** $	374692.36	ERR

1/90

A1-L46 ENTER MONTH (NUMERIC): 1 ENTER CY (NUMERIC,YY): 90 32874

Schofield Barracks Electric Meter Readings - Sheet 1

(update every FY)

Month,CY : Jan-90 FY: 1990 HECO fuel oil rate : -0.02331 Rate A : 0.09420 0.07089

Read'g dte: HELCO fuel oil rate : -0.01557 Rate B : 0.09926

Location	Reading No.	Meter No.	Present Reading	Previous Reading	Mult. Factor	Computed Consump. (KWH)	Interval Between Readings (Days)	KWH Per 30.4 Days	KWH Per 30.4 Days Last Month	diff (%)
100 Area Nr Bldg 111	1	2045	4149	3954	120	23400	24	29,640	31,071	-4.6
300 Area Nr Bldg 321	2	8896	9178	7997	10	11810	24	14,959	15,284	-2.1
1300 Area Nr Bldg 1320	3	6219	5609	5492	1800	210600	24	266,760	211,332	26.2
1400 Area Nr Bldg 1320	4	154	9681	9537	1200	172800	24	218,880	233,975	-6.5
SB Substation-Ckt 20	5	900	0	0	2771	0	24	0	0	0.0
SB Substation-Ckt 21	6	651	2963	2564	2771	1105629	24	1,400,463	1,594,720	-12.2
SB Substation-Main	7	6184	10194	9923	32000	8672000	24	10,984,533	10,130,538	8.4
Solomon School	8	4729	9513	9412	160	16160	24	20,469	14,257	43.6
Solomon School	9	7529	3735	3680	40	2200	24	2,787	2,432	14.6
1300 Area Nr Bldg 1370	10	8897	940	11	10	9290	24	11,767	11,248	4.6
1900 Area Nr Bldg 1983	11	145	5177	4984	1200	231600	24	293,360	289,324	1.4
3000 Area Nr Bldg 3930	12	147	2587	2515	1200	86400	24	109,440	109,440	0.0
Area I UH Welding Shop	13	1879	7764	6647	1	1117	24	1,415	1,215	16.5
Area I UH Welding Shop	14	3470	607	604	100	300	24	380	314	21.0
800 Area Nr Bldg T-822	15	6979	2060	1980	160	12800	24	16,213	18,785	-13.7
9000 Area Nr Ofc Club	16	6218	847	365	1800	867600	24	1,098,960	867,972	26.6
Helemano Mil Res	17	8177	3446	3349	1000	97000	24	122,867	114,262	7.5
3000 Area Nr Bldg 3611	18	6223	7255	6848	1200	488400	24	618,640	607,581	1.8
Commissary	19	1514	5237	5041	1200	235200	24	297,920	286,808	3.9
First Hawaiian Bank	20	1545	7341	7169	40	6880	24	8,715	7,212	20.8
SB Sewage Trtmt Plant	21	7178	3550	3230	600	192000	24	243,200	237,120	2.6
WAFB Aviation Fac	22	4193	2910	2695	60	12900	24	16,340	12,013	36.0
South Ramp WAFB	23	4734	95725	95664	1	61	24	77	79	-2.5
SFTS WAFB	24	807	9594	9214	80	30400	24	38,507	35,558	8.3
SFTS WAFB	25	676	7586	7281	1	305	24	386	355	8.7
Bldg 114 WAFB	26	3782	454	451	1	3	24	4	3	33.3
Mauna Kapu	27	5041	0	8092	1	0	24	0	644	-100.0
QUAD A	28	6971	3233	2586	240	155280	24	196,688	191,457	2.7
QUAD A	29	8004	2216	1814	160	64320	24	81,472	80,004	1.8

1|90

A48-K101

Schofield Barracks Family Housing Reimbursements

Month,CY : Jan-90 FY: 1990

1. Public Housing 1970 & After (Cat N)

	Units Metered	Reading No.	KWH-Meas or Est.	Adj. Factor (Tot units/Mtrd units)		Billing Qty (KWH)	KWH/ Unit
FY71	208	Estimate	297440	215	208	307450	1430
FY72	208	11	231600	300	208	334038	1113
FY73	497	16	867600	640	497	1117231	1746

Total Cat (N) ******** 1758719 KWH X 0.07089 = $$$ 124675.59

2. Public Housing 1950-1969 - (Cat X) - Schofield Barracks (Rate A-FOA)

	Units Metered	Reading No.	KWH-Meas or Est.	Adj. Factor	Billing Qty (KWH)	KWH/ Unit
3000 Area	112	* 12	128688			1149
3000 Area	320	18	488400			1526
1400 Area	224	4	172800			771
1300+1400	492	Estimate	592416			1204
Sub-Total	1148		1382304	2140 /1148	2576769	1204

Sub-total 1 Cat (X) : 2576769 KWH X 0.07089 = $$$ 182667.15
(Rate A-FOA)

Location	Units Metered	KWH/Unit (Est)	Billing Qty(KWH)	Rate A (FOA)	Cost($)
Helemano	32	1204	38528	0.07089	2731.25

Sub-total 2 Cat (X) : 38528 KWH, $ 2731.25

Total Cat (X) ******** 2615297 KWH, $ 185398.40

2/90

A1-L46 ENTER MONTH (NUMERIC): 2 ENTER CY (NUMERIC,YY): 90 32905

Schofield Barracks Electric Meter Readings - Sheet 1

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(update every FY)

Month,CY : Feb-90 FY: 1990 HECO fuel oil rate : Rate A : 0.09420

Read'g dte: HELCO fuel oil rate : Rate B : 0.09926

Location	Reading No.	Meter No.	Present Reading	Previous Reading	Mult. Factor	Computed Consump. (KWH)	Interval Between Readings (Days)	KWH Per 30.4 Days	KWH Per 30.4 Days Last Month	diff (%)
100 Area Nr Bldg 111	1	2045	4405	4149	120	30720	31	30,125	29,640	1.6
300 Area Nr Bldg 321	2	8896	10711	9178	10	15330	31	15,033	14,959	0.5
1300 Area Nr Bldg 1320	3	6219	5757	5609	1800	266400	31	261,244	266,760	-2.1
1400 Area Nr Bldg 1320	4	154	9889	9681	1200	249600	31	244,769	218,880	11.8
SB Substation-Ckt 20	5	900	498	0	2771	1379958	31	1,353,249	0	0.0
SB Substation-Ckt 21	6	651	2964	2963	2771	2771	31	2,717	1,400,463	-99.8
SB Substation-Main	7	6184	10531	10194	32000	10784000	31	10,575,277	10,984,533	-3.7
Solomon School	8	4729	9640	9513	160	20320	31	19,927	20,469	-2.6
Solomon School	9	7529	3797	3735	40	2480	31	2,432	2,787	-12.7
1300 Area Nr Bldg 1370	10	8897	2233	940	10	12930	31	12,680	11,767	7.8
1900 Area Nr Bldg 1983	11	145	5418	5177	1200	289200	31	283,603	293,360	-3.3
3000 Area Nr Bldg 3930	12	147	2681	2587	1200	112800	31	110,617	109,440	1.1
Area I UH Welding Shop	13	1879	9589	7764	1	1825	31	1,790	1,415	26.5
Area I UH Welding Shop	14	3470	613	607	100	600	31	588	380	54.7
800 Area Nr Bldg T-822	15	6979	2181	2060	160	19360	31	18,985	16,213	17.1
9000 Area Nr Ofc Club	16	6218	1457	847	1800	1098000	31	1,076,748	1,098,960	-2.0
Helemano Mil Res	17	8177	3571	3446	1000	125000	31	122,581	122,867	-0.2
3000 Area Nr Bldg 3611	18	6223	7777	7255	1200	626400	31	614,276	618,640	-0.7
Commissary	19	1514	5492	5237	1200	306000	31	300,077	297,920	0.7
First Hawaiian Bank	20	1545	7494	7341	40	6120	31	6,002	8,715	-31.1
SB Sewage Trtmt Plant	21	7178	3935	3550	600	231000	31	226,529	243,200	-6.9
WAFB Aviation Fac	22	4193	3126	2910	60	12960	31	12,709	16,340	-22.2
South Ramp WAFB	23	4734	95803	95725	1	78	31	76	77	-1.3
SFTS WAFB	24	807	10005	9594	80	32880	31	32,244	38,507	-16.3
SFTS WAFB	25	676	7922	7586	1	336	31	329	386	-14.8
Bldg 114 WAFB	26	3782	458	454	1	4	31	4	4	0.0
Mauna Kapu	27	5041	0	0	1	0	31	0	0	0.0
QUAD A	28	6971	4007	3233	240	185760	31	182,165	196,688	-7.4
QUAD A	29	8004	2738	2216	160	83520	31	81,903	81,472	0.5

2/90

A48-K101

Schofield Barracks Family Housing Reimbursements

Month,CY : Feb-90 FY: 1990

1. Public Housing 1970 & After (Cat N)

	Units Metered	Reading No.	KWH-Meas or Est.	Adj. Factor (Tot units/Mtrd units)		Billing Qty (KWH)	KWH/ Unit
FY71	208	Estimate	374400	215	208	387000	1800
FY72	208	11	289200	300	208	417115	1390
FY73	497	16	1098000	640	497	1413924	2209

Total Cat (N) ******** 2218039 KWH X 0.00000 = $$$ 0.00

2. Public Housing 1950-1969 - (Cat X) - Schofield Barracks (Rate A-FOA)

	Units Metered	Reading No.	KWH-Meas or Est.	Adj. Factor	Billing Qty (KWH)	KWH/ Unit
3000 Area	112	* 12	172032			1536
3000 Area	320	18	626400			1958
1400 Area	224	4	249600			1114
1300+1400	492	Estimate	786024			1598
Sub-Total	1148		1834056	2140 /1148	3418885	1598

Sub-total 1 Cat (X) : 3418885 KWH X 0.00000 = $$$ 0.00
(Rate A-FOA)

Location	Units Metered	KWH/Unit (Est)	Billing Qty(KWH)	Rate A (FOA)	Cost($)
Helemano	32	1598	51136	0.00000	0.00

Sub-total 2 Cat (X) : 51136 KWH, $ 0.00

Total Cat (X) ******** 3470021 KWH, $ 0.00

4. Sub-St[illegible] Housing - KMC (Cat Z)

900 KWH/Unit (Est) X	6 Units =	5400	X Rate A (FOA)	0.00000	=	$$$	0.00

Total SB Family Housing	6187458	**	$	0.00	
Total SB FH w/o KMC	6182058	**	$	0.00	ERR

RUN DA[illegible] 08/90 HECO CUSTOMER CONSUMPTION AND DI[illegible] HISTORY MK32R1 AS OF 12/31/8[illegible]

ACCOUNT NUMBER	RATE	BUS CODE	YEAR TO DATE	1988	1989	12 MO. ENDING	12/31/88	12/31/[illegible]
71-983-905-75	P	971						
			HIGH KW	19200.0	20160.0	HIGH KW	19200.0	20160.0
NAME / ADDRESS	DISCOUNT / SURCHARGE		LOW KW	16640.0	17600.0	LOW KW	16640.0	17600.0
USA DFE ITEM A11	3.3TP		AVG KW	18400.0	19066.7	AVG KW	18400.0	19066.7
HQ USASCH								
(ITEM A-11)	METER NUMBER		AVG KWH/MO	9970667	10410667	AVG KWH/MO	9970667	10410667
FT SHAFTER HI								
96858	KWH	RKVAH	AVG KWH/KW	541.4	547.3	AVG KWH/KW	541.4	547.3
	386184	385571						
SERVICE ADDRESS			TOTAL KWH	119648000	124928000	TOTAL KWH	119648000	124928000
1641 WILIKINA DR	MULTIPLIER							
	32000		TOTAL NET BILL $	6269020.44	6989616.22	TOTAL NET BILL $	6269020.44	6989616.22
			AVG KWH COST $	0.052	0.056	AVG KWH COST $	0.052	0.056

BILL DATE	BILL DAYS	PWR FCTR %	MEASRD DMD KW	BILL DMD KW	ENERGY USAGE KWH	DEMAND CHARGE $	ENERGY CHARGE $	DISCOUNT/ SURCHARGE $	POWER FACTOR ADJ. $	FUEL OIL ADJ. $	NET BILL $	KWH USE PER DAY	KWH/KW NORMALIZED 30.4 DAYS
1/29/88	29	93.0	17280.0	18400.0	8864000	102900.00	671555.97	25709.99-	6232.73-	191844.47-	550668.78	305655.2	537.7
3/01/88	32	93.0	17600.0	18560.0	9728000	103780.00	730833.54	27711.39-	6717.91-	241187.52-	558996.72	304000.0	525.1
3/30/88	29	93.0	16640.0	18080.0	8704000	101140.00	659486.85	25250.63-	6121.37-	226739.20-	502515.65	300137.9	548.3
4/29/88	30	93.0	16960.0	18240.0	8992000	102020.00	679647.10	25950.36-	6291.00-	240239.26-	509186.48	299733.3	537.3
5/31/88	32	92.0	18880.0	19200.0	10206000	107300.00	765837.70	28991.68-	6149.75-	324186.94-	513809.33	319000.0	513.6
6/29/88	29	90.0	19200.0	19360.0	10112000	108180.00	759919.74	28823.63-	4367.22-	322763.84-	513145.05	348689.7	557.1
7/29/88	30	90.0	18880.0	19200.0	10454000	107300.00	783223.17	29570.20-	4480.33-	324265.41-	532207.23	348000.0	561.6
8/30/88	32	90.0	19200.0	19360.0	11200000	108180.00	833808.00	31282.34-	4739.75-	363132.00-	542833.91	350000.0	554.2
9/29/88	30	90.0	19200.0	19200.0	10464000	107300.00	783223.17	29570.20-	4480.33-	347572.22-	508905.42	348800.0	552.3
10/31/88	32	91.0	19200.0	19200.0	11008000	107300.00	820167.30	30799.55-	5599.92-	350869.68-	540198.15	344000.0	544.7
12/01/88	31	92.0	19200.0	19200.0	10080000	107300.00	757144.96	28702.42-	6088.39-	313036.03-	516618.12	325161.3	514.8
12/30/88	29	92.0	18560.0	18880.0	9824000	105540.00	738556.29	28026.12-	5944.93-	330184.64-	479940.60	338758.6	554.9
CURRENT CALENDAR YEAR													
1/30/89	31	92.0	19200.0	19200.0	10368000	107300.00	776703.62	29353.26-	6226.45-	361445.00-	506979.91	334451.6	529.5
3/01/89	30	92.0	18560.0	18880.0	9920000	105540.00	743075.84	28243.06-	5990.95-	298135.68-	518246.35	330666.7	541.6
3/31/89	30	91.0	17600.0	18400.0	9344000	102900.00	704153.73	26794.72-	4871.77-	270882.56-	504504.68	311466.7	538.0
5/01/89	31	92.0	17920.0	18560.0	10240000	103780.00	765512.98	28868.43-	6123.61-	268420.13-	565880.81	330322.6	560.4
5/31/89	30	91.0	18240.0	18720.0	10048000	104660.00	750383.68	28483.43-	5178.81-	237132.80-	584248.64	334933.3	558.2
6/29/89	29	90.0	18880.0	19040.0	10016000	106420.00	749422.56	28508.90-	4319.53-	218649.28-	604364.85	345379.3	556.1
7/31/89	32	90.0	19840.0	19840.0	11136000	110820.00	828181.76	31284.39-	4740.06-	224435.64-	678541.67	348000.0	533.2
8/30/89	30	90.0	19200.0	19520.0	10752000	109060.00	801006.72	30318.82-	4593.76-	245468.16-	629685.58	358400.0	567.5
9/29/89	30	90.0	19640.0	19840.0	10976000	110820.00	817360.16	30922.81-	4685.27-	281881.97-	610690.12	365866.7	560.6
10/31/89	32	90.0	19840.0	19840.0	11488000	110820.00	851989.28	32079.85-	4860.58-	305954.16-	619914.69	359000.0	550.1
11/30/89	30	91.0	20160.0	20160.0	10656000	112580.00	796920.16	30297.45-	5508.63-	283556.16-	590137.92	355200.0	535.6
12/29/89	29	92.0	19520.0	19840.0	9984000	110820.00	750266.24	28681.05-	6083.86-	249899.52-	576421.81	344275.9	536.7

field Barracks Electric Meter Readings - Sheet 1

(update every FY)

h,CY :	Jan-89	FY:	89	HECO fuel oil rate :	-0.03291
l'g dte:				HELCO fuel oil rate :	-0.02121

Rate A : 0.09210
Rate B : 0.09710

ition	Reading No.	Meter No.	Present Reading	Previous Reading	Mult. Factor	Computed Consump. (KWH)	Interval Between Readings (Days)	KWH Per 30.4 Days	KWH Per 30.4 Days Last Month	diff (%)
Area Nr Bldg 111	1	2045	1345	1227	120	14160	16	26,904	28,020	-4.0
Area Nr Bldg 321	2	8896	2573	1829	10	7440	16	14,136	13,887	1.8
) Area Nr Bldg 1320	3	6219	4114	4048	1800	118800	16	225,720	293,392	-23.1
0 Area Nr Bldg 1320	4	154	7578	7485	1200	111600	16	212,040	219,656	-3.5
Substation-Ckt 20	5	1100	5498	4362	600	681600	16	1,295,040	1,558,938	-16.9
Substation-Ckt 21	6	1099	7089	7089	600	0	16	0	0	0.0
Substation-Main	7	6184	6341	6172	32000	5408000	16	10,275,200	10,204,051	0.7
omon School	8	4729	7945	7851	160	15040	16	28,576	19,353	47.7
omon School	9	7529	2913	2872	40	1640	16	3,116	103	2925.2
0 Area Nr Bldg 1370	10	8897	7587	6996	10	5910	16	11,229	11,047	1.6
O Area Nr Bldg 1983	11	145	2341	2210	1200	157200	16	298,680	293,392	1.8
O Area Nr Bldg 3930	12	147	1581	1535	1200	55200	16	104,880	110,992	-5.5
a I UH Welding Shop	13	1879	3780	2922	1	858	16	1,630	1,153	41.4
Welding Shop	14	3470	557	554	100	300	16	570	323	76.5
Bldg T-822	15	6979	861	818	160	6880	16	13,072	15,834	-17.4
O Nr Ofc Club	16	6218	5387	5180	1800	372600	16	707,940	416,803	69.9
lemano Mil Res	17	8177	2079	2012	1000	67000	16	127,300	114,485	11.2
O Area Nr Bldg 3611	18	6223	1702	1454	1200	297600	16	565,440	571,261	-1.0
missary	19	1514	2321	2219	1200	122400	16	232,560	189,386	22.8
rst Hawaiian Bank	20	1545	5564	5496	40	2720	16	5,168	8,357	-38.2
Sewage Trtmt Plant	21	7178	9073	8877	600	117600	16	223,440	215,775	3.6
FB Aviation Fac	22	4193	9822	9694	60	7680	16	14,592	11,565	26.2
uth Ramp WAFB	23	4734	94887	94837	1	50	16	95	80	18.8
TS WAFB	24	807	4141	3957	80	14720	16	27,968	24,993	11.9
TS WAFB	25	676	3151	2919	1	232	16	441	309	42.7
dg 114 WAFB	26	3782	370	366	1	4	16	8	8	0.0
una Kapu	27	5041	2789	2394	1	395	16	751	332	126.2
AD A	28	6971	3788	3376	240	98880	16	187,872	150,422	24.9
AD A	29	8004	6236	5970	160	42560	16	80,864	76,893	5.2
lemano, Bldg 300	30	2566	9931	9927	200	800	16	1,520	1,294	17.5
nia Tunnel	31	6611	9170	8995	4000	700000	16	1,330,000	561,430	136.9
ea X	32	4550	593	580	1200	15600	16	29,640	28,718	3.2
dg T-300, WAFB	33	6093	9662	9588	120	8880	16	16,872	1,552	987.1
dg 1020,WAFB	34	8619	9662	9659	120	360	16	684	8,150	-91.6

A48-K101
Schofield Barracks Family Housing Reimbursements

Month,CY : Jan-89 FY: 89

1. Public Housing 1970 & After (Cat N)

	Units Metered	Reading No.	KWH-Meas or Est.	Adj. Factor (Tot units/Mtrd units)		Billing Qty (KWH)	KWH/ Unit
FY71	208	Estimate	156624	215	208	161895	753
FY72	208	11	157200	300	208	226731	756
FY73	497	16	372600	640	497	479807	750

Total Cat (N) ######## 868433 KWH X 0.05919 = $$$ 51402.55

2. Public Housing 1950-1969 - (Cat X) - Schofield Barracks (Rate A-FOA)

	Units Metered	Reading No.	KWH-Meas or Est.	Adj. Factor	Billing Qty (KWH)	KWH/ Unit
3000 Area	112	# 12	79968			714
3000 Area	320	18	297600			930
1400 Area	224	4	111600			498
1300+1400	492	Estimate	366876			746
Sub-Total	1148		856044	2140 /1148	1595761	746

Sub-total 1 Cat (X) : 1595761 KWH X 0.05919 = $$$ 94453.09
(Rate A-FOA)

Location	Units Metered	KWH/Unit (Est)	Billing Qty(KWH)	Rate A (FOA)	Cost($)
Helemano	32	746	23872	0.05919	1412.98

Sub-total 2 Cat (X) : 23872 KWH, $ 1412.98

Total Cat (X) ######## 1619633 KWH, $ 95866.07

3. Other Public Housing (Cat Y)

821 KWH/Unit (Est) X 281 Units = 230701 X Rate A (FOA) 0.05919 = $$$ 13655.19

4. Sub-Standard Housing - KMC (Cat Z)

900 KWH/Unit (Est) X 6 Units = 5400 X Rate A (FOA) 0.07089 = $$$ 382.81

Total SB Family Housing	2724167	## $	161306.62
Total SB FH w/o KMC	2718767	## $	160923.81

hofield Barracks Electric Meter Readings - Sheet 1

h,CY : Mar-89	FY: 89	HECO fuel oil rate :	-0.02899	(update every FY) Rate A :	0.09210
Read'g dte:		HELCO fuel oil rate :	-0.02826	Rate B :	0.09710

Location	Reading No.	Meter No.	Present Reading	Previous Reading	Mult. Factor	Computed Consump. (KWH)	Interval Between Readings (Days)	KWH Per 30.4 Days	KWH Per 30.4 Days Last Month	diff (%)
100 Area Nr Bldg 111	1	2045	1804	1596	120	24960	28	27,099	28,614	-5.3
300 Area Nr Bldg 321	2	8896	5274	4041	10	12330	28	13,387	13,946	-4.0
1300 Area Nr Bldg 1320	3	6219	4357	4239	1800	212400	28	230,606	213,750	7.9
1400 Area Nr Bldg 1320	4	154	7922	7756	1200	199200	28	216,274	202,920	6.6
SB Substation-Ckt 20	5	1100	9279	7468	600	1086600	28	1,179,737	1,122,900	5.1
SB Substation-Ckt 21	6	1099	7089	7089	600	0	28	0	0	0.0
SB Substation-Main	7	6184	6941	6666	32000	8800000	28	9,554,286	9,880,000	-3.3
Solomon School	8	4729	8237	8114	160	19680	28	21,367	25,688	-16.8
Solomon School	9	7529	3058	2992	40	2640	28	2,866	3,002	-4.5
1300 Area Nr Bldg 1370	10	8897	9823	8796	10	10270	28	11,150	11,486	-2.9
1900 Area Nr Bldg 1983	11	145	2819	2598	1200	265200	28	287,931	292,980	-1.7
3000 Area Nr Bldg 3930	12	147	1751	1675	1200	91200	28	99,017	107,160	-7.6
Area I UH Welding Shop	13	1879	6857	5630	1	1227	28	1,332	1,758	-24.2
Area I UH Welding Shop	14	3470	568	566	100	200	28	217	855	-74.6
800 Area Nr Bldg T-822	15	6979	1062	973	160	14240	28	15,461	17,024	-9.2
9000 Area Nr Ofc Club	16	6218	6153	5780	1800	671400	28	728,949	672,030	8.5
Helemano Mil Res	17	8177	2287	2203	1000	84000	28	91,200	117,800	-22.6
00 Area Nr Bldg 3611	18	6223	2623	2219	1200	484800	28	526,354	589,380	-10.7
issary	19	1514	2875	2661	1200	256800	28	278,811	387,600	-28.1
st Hawaiian Bank	20	1545	5840	5701	40	5560	28	6,037	5,206	16.0
SB Sewage Trtmt Plant	21	7178	9778	9456	600	193200	28	209,760	218,310	-3.9
WAFB Aviation Fac	22	4193	296	14	60	16920	28	18,370	10,944	67.9
South Ramp WAFB	23	4734	95025	94968	1	57	28	62	77	-19.5
SFTS WAFB	24	807	4717	4346	80	29680	28	32,224	15,580	106.8
SFTS WAFB	25	676	3959	3585	1	374	28	406	412	-1.5
Bldg 114 WAFB	26	3782	383	376	1	7	28	8	6	33.3
Mauna Kapu	27	5041	3389	3031	1	358	28	389	230	69.1
QUAD A	28	6971	5248	4551	240	167280	28	181,618	173,964	4.4
QUAD A	29	8004	7202	6744	160	73280	28	79,561	77,216	3.0
Helemano, Bldg 300	30	2566	9954	9944	200	2000	28	2,171	2,470	-12.1
Kunia Tunnel	31	6611	9728	9442	4000	1144000	28	1,242,057	1,033,600	20.2
Area X	32	4550	638	615	1200	27600	28	29,966	25,080	19.5
Bldg T-300, WAFB	33	6093	2101	2092	120	1080	28	1,173	1,026	14.3
Bldg 1020,WAFB	34	8619	9660	9662	120	0	28	0	9,500	-100.0

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Schofield Barracks Family Housing Reimbursements

Month,CY : Mar-89 FY: 89

1. Public Housing 1970 & After (Cat N)

	Units Metered	Reading No.	KWH-Meas or Est.	Adj. Factor (Tot units/	Mtrd units)	Billing Qty (KWH)	KWH/ Unit
Y71	208	Estimate	273104	215	208	282295	1313
Y72	208	11	265200	300	208	382500	1275
Y73	497	16	671400	640	497	864579	1351

Total Cat (N) ######## 1529374 KWH X 0.06311 = $$$ 96518.79

. Public Housing 1950-1969 - (Cat X) - Schofield Barracks (Rate A-FDA)

	Units Metered	Reading No.	KWH-Meas or Est.	Adj. Factor	Billing Qty (KWH)	KWH/ Unit
X00 Area	112	* 12	134624			1202
X00 Area	320	18	484800			1515
100 Area	224	4	199200			889
X	492	Estimate	613968			1248
b-Total	1148		1432592	2140 /1148	2670511	1248

Sub-total 1 Cat (X) : 2670511 KWH X 0.06311 = $$$ 168535.95
(Rate A-FDA)

ocation	Units Metered	KWH/Unit (Est)	Billing Qty(KWH)	Rate A (FDA)	Cost($)
emano	32	1248	39936	0.06311	2520.36

Sub-total 2 Cat (X) : 39936 KWH, $ 2520.36

Total Cat (X) ######## 2710447 KWH, $ 171056.31

Other Public Housing (Cat Y)

1373 KWH/Unit (Est) X 281 Units = 385813 X Rate A (FDA) 0.06311 = $$$ 24348.66

Sub-Standard Housing - KMC (Cat Z)

900 KWH/Unit (Est) X 3 ~~6~~ Units = 5400 X Rate A (FDA) 0.06384 = $$$ 344.74

Total SB Family Housing	4631034	** $	292268.50
Total SB FH w/o KMC	4625634	** $	291923.76

ofield Barracks Electric Meter Readings - Sheet 1

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ch,CY : Apr-89 FY: 89 HECO fuel oil rate : -0.02630 (update every FY) Rate A : 0.09210

Read'g dte: HELCO fuel oil rate : -0.02305 Rate B : 0.09710

Location	Reading No.	Meter No.	Present Reading	Previous Reading	Mult. Factor	Computed Consump. (KWH)	Interval Between Readings (Days)	KWH Per 30.4 Days	KWH Per 30.4 Days Last Month	diff (%)
100 Area Nr Bldg 111	1	2045	2031	1804	120	27240	30	27,603	27,099	1.9
300 Area Nr Bldg 321	2	8896	6661	5274	10	13870	30	14,055	13,387	5.0
1300 Area Nr Bldg 1320	3	6219	4460	4357	1800	185400	30	187,872	230,606	-18.5
1400 Area Nr Bldg 1320	4	154	8105	7922	1200	219600	30	222,528	216,274	2.9
SB Substation-Ckt 20	5	1100	11215	9279	600	1161600	30	1,177,088	1,179,737	-0.2
SB Substation-Ckt 21	6	1099	7089	7089	600	0	30	0	0	0.0
SB Substation-Main	7	6184	7253	6941	32000	9984000	30	10,117,120	9,554,286	5.9
Solomon School	8	4729	8424	8237	160	29920	30	30,319	21,367	41.9
Solomon School	9	7529	3146	3058	40	3520	30	3,567	2,866	24.5
1300 Area Nr Bldg 1370	10	8897	11042	9823	10	12190	30	12,353	11,150	10.8
1900 Area Nr Bldg 1983	11	145	3059	2819	1200	288000	30	291,840	287,931	1.4
3000 Area Nr Bldg 3930	12	147	1841	1751	1200	108000	30	109,440	99,017	10.5
Area I UH Welding Shop	13	1879	7922	6857	1	1065	30	1,079	1,332	-19.0
Area I UH Welding Shop	14	3470	570	568	100	200	30	203	217	-6.5
800 Area Nr Bldg T-822	15	6979	1168	1062	160	16960	30	17,186	15,461	11.2
9000 Area Nr Ofc Club	16	6218	6557	6153	1800	727200	30	736,896	728,949	1.1
Helemano Mil Res	17	8177	~~2301~~ 2401	2287	1000	14000	30	14,187	91,200	-84.4
0 Area Nr Bldg 3611	18	6223	3111	2623	1200	585600	30	593,408	526,354	12.7
missary	19	1514	3103	2875	1200	273600	30	277,248	278,811	-0.6
irst Hawaiian Bank	20	1545	5997	5840	40	6280	30	6,364	6,037	5.4
SB Sewage Trtmt Plant	21	7178	10138	9778	600	216000	30	218,880	209,760	4.3
WAFB Aviation Fac	22	4193	407	296	60	6660	30	6,749	18,370	-63.3
South Ramp WAFB	23	4734	95094	95025	1	69	30	70	62	12.9
SFTS WAFB	24	807	5152	4717	80	34800	30	35,264	32,224	9.4
SFTS WAFB	25	676	4397	3959	1	438	30	444	406	9.4
Bldg 114 WAFB	26	3782	391	383	1	8	30	8	8	0.0
Mauna Kapu	27	5041	3663	3389	1	274	31	269	389	-30.8
QUAD A	28	6971	5907	5248	240	158160	30	160,269	181,618	-11.8
QUAD A	29	8004	7689	7202	160	77920	30	78,959	79,561	-0.8
Helemano, Bldg 300	30	2566	9963	9954	200	1800	30	1,824	2,171	-16.0
Kunia Tunnel	31	2566	10022	9728	4000	1176000	30	1,191,680	1,242,057	-4.1
Area X	32	4550	660	638	1200	26400	30	26,752	29,966	-10.7
Bldg T-300, WAFB	33	6093	2110	2101	120	1080	30	1,094	1,173	-6.7
Bldg 1020,WAFB	34	8619	9656	9652	120	480	30	486	0	0.0

-K101
.ofield Barracks Family Housing Reimbursements

Month,CY : Apr-89 FY: 89

1. Public Housing 1970 & After (Cat N)

	Units Metered	Reading No.	KWH-Meas or Est.	Adj. Factor (Tot units/Mtrd units)		Billing Qty (KWH)	KWH/ Unit
FY71	208	Estimate	296192	215	208	306160	1424
FY72	208	11	288000	300	208	415385	1385
FY73	497	16	727200	640	497	936435	1463

Total Cat (N) ******** 1657980 KWH X 0.06580 = $$$ 109095.08

2. Public Housing 1950-1969 - (Cat X) - Schofield Barracks (Rate A-FOA)

	Units Metered	Reading No.	KWH-Meas or Est.	Adj. Factor	Billing Qty (KWH)	KWH/ Unit
3000 Area	112	* 12	157360			1405
3000 Area	320	18	585600			1830
1400 Area	224	4	219600			980
1300+1400	492	Estimate	721920			1467
Total	1148	-	1684480	2140 /1148	3140059	1467

Sub-total 1 Cat (X) : 3140059 KWH X 0.06580 = $$$ 206615.88
(Rate A-FOA)

Location	Units Metered	KWH/Unit (Est)	Billing Qty(KWH)	Rate A (FOA)	Cost($)
Helemano	32	1467	46944	0.06580	3088.92

Sub-total 2 Cat (X) : 46944 KWH, $ 3088.92

Total Cat (X) ******** 3187003 KWH, $ 209704.80

3. Other Public Housing (Cat Y)

1614 KWH/Unit (Est) X 281 Units = 453534 X Rate A (FOA) 0.06580 = $$$ 29842.54

4. Sub-Standard Housing - KMC (Cat Z)

900 KWH/Unit (Est) X 6 Units = 5400 X Rate A (FOA) 0.06905 = $$$ 372.87

Total SB Family Housing	5303917	** $	349015.29
Total SB FH w/o KMC	5298517	** $	348642.42

Schofield Barracks Electric Meter Readings - Sheet 1

Month,CY : Jun-89	FY:	HECO fuel oil rate : -0.02183	(update every FY) Rate A : 0.09210
Read'g dte:		HELCO fuel oil rate : -0.02067	Rate B : 0.09710

Location	Reading No.	Meter No.	Present Reading	Previous Reading	Mult. Factor	Computed Consump. (KWH)	Interval Between Readings (Days)	KWH Per 30.4 Days	KWH Per 30.4 Days Last Month	diff (%)
100 Area Nr Bldg 111	1	2045	2486	2251	120	28200	30	28,576	28,663	-0.3
300 Area Nr Bldg 321	2	8896	9295	7928	10	13670	30	13,852	13,756	0.7
1300 Area Nr Bldg 1320	3	6219	4766	4666	1800	180000	30	182,400	207,154	-11.9
1400 Area Nr Bldg 1320	4	154	8432	8267	1200	198000	30	200,640	211,063	-4.9
SB Substation-Ckt 20	5	1100	4302	3036	600	759600	30	769,728	1,186,251	-35.1
SB Substation-Ckt 21	6	1099	2954	2089	600	519000	30	525,920	0	0.0
SB Substation-Main	7	6184	7870	7545	32000	10400000	30	10,538,667	10,144,914	3.9
Solomon School	8	4729	8683	8573	160	17600	30	17,835	25,883	-31.1
Solomon School	9	7529	3272	3211	40	2440	30	2,473	2,823	-12.4
1300 Area Nr Bldg 1370	10	8897	3117	2130	10	9870	30	10,002	11,813	-15.3
1900 Area Nr Bldg 1983	11	145	3515	3284	1200	277200	30	280,896	293,143	-4.2
3000 Area Nr Bldg 3930	12	147	1999	1918	1200	97200	30	98,496	100,320	-1.8
Area I UH Welding Shop	13	1879	9212	8873	1	339	30	344	1,033	-66.7
Area 1 UH Welding Shop	14	3470	578	576	100	200	30	203	651	-68.8
800 Area Nr Bldg T-822	15	6979	1355	1262	160	14880	30	15,078	16,329	-7.7
9000 Area Nr Ofc Club	16	6218	7376	6966	1800	738000	30	747,840	738,720	1.2
Helemano Mil Res	17	8177	2636	2512	1000	124000	30	125,653	120,514	4.3
3000 Area Nr Bldg 3611	18	6223	3965	3533	1200	518400	30	525,312	549,806	-4.5
Commissary	19	1514	3556	3308	1200	297600	30	301,568	267,086	12.9
First Hawaiian Bank	20	1545	6340	6151	40	7560	30	7,661	6,688	14.5
SB Sewage Trtmt Plant	21	7178	798	445	600	211800	30	214,624	199,989	7.3
WAFB Aviation Fac	22	4193	1075	746	60	19740	30	20,003	21,432	-6.7
South Ramp WAFB	23	4734	95219	95155	1	64	30	65	66	-1.5
SFTS WAFB	24	807	6147	5611	80	42880	30	43,452	39,867	9.0
SFTS WAFB	25	676	5175	4768	1	407	30	412	403	2.2
Bldg 114 WAFB	26	3782	413	402	1	11	30	11	12	-8.3
Mauna Kapu	27	5041	4776	3932	1	844	30	855	292	192.8
QUAD A	28	6971	7538	6735	240	192720	30	195,290	192,302	1.6
QUAD A	29	8004	8688	8175	160	82080	30	83,174	84,425	-1.5
Helemano, Bldg 300	30	2566	9985	9975	200	2000	30	2,027	2,606	-22.2
Kunia Tunnel	31	6611	594	303	4000	1164000	30	1,179,520	1,220,343	-3.3
Area X	32	4550	713	682	1200	37200	30	37,696	28,663	31.5
Bldg T-300, WAFB	33	6093	2121	2117	120	480	30	486	912	-46.7
Bldg 1020,WAFB	34	8619	9660	9652	120	960	30	973	521	86.8
							30			

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ɔfield Barracks Family Housing Reimbursements

:h,CY : Jun-89 FY:

Public Housing 1970 & After (Cat N)

	Units Metered	Reading No.	KWH-Meas or Est.	Adj. Factor (Tot units/Mtrd units)		Billing Qty (KWH)	KWH/ Unit
1	208	Estimate	293072	215	208	302935	1409
2	208	11	277200	300	208	399808	1333
3	497	16	738000	640	497	950342	1485

Total Cat (N) ######## 1653085 KWH X 0.07027 = $$$ 116162.28

Public Housing 1950-1969 - (Cat X) - Schofield Barracks (Rate A-FOA)

	Units Metered	Reading No.	KWH-Meas or Est.	Adj. Factor	Billing Qty (KWH)	KWH/ Unit
0 Area	112	# 12	140224			1252
0 Area	320	18	518400			1620
0 '	224	4	198000			884
0-	492	Estimate	642468			1306
-Total	1148		1499092	2140 /1148	2794475	1306

Sub-total 1 Cat (X) : 2794475 KWH X 0.07027 = $$$ 196367.76
(Rate A-FOA)

:ation	Units Metered	KWH/Unit (Est)	Billing Qty(KWH)	Rate A (FOA)	Cost($)
emano	32	1306	41792	0.07027	2936.72

Sub-total 2 Cat (X) : 41792 KWH, $ 2936.72

Total Cat (X) ######## 2836267 KWH, $ 199304.48

Other Public Housing (Cat Y)

1437 KWH/Unit (Est) X 281 Units = 403797 X Rate A (FOA) 0.07027 = $$$ 28374.82

Sub-Standard Housing - KMC (Cat Z)

900 KWH/Unit (Est) X 6 Units = 5400 X Rate A (FOA) 0.07143 = $$$ 385.72

Total SB Family Housing 4898549 ## $ 344227.30
Total SB FH w/o KMC 4893149 ## $ 343841.58

Schofield Barracks Electric Meter Readings - Sheet 1

						(update every FY)
Month,CY :	Jul-89	FY: 89	HECO fuel oil rate :	-0.02010	Rate A :	0.09210
Read'g dte:			HELCO fuel oil rate :	-0.01513	Rate B :	0.09710

Location	Reading No.	Meter No.	Present Reading	Previous Reading	Mult. Factor	Computed Consump. (KWH)	Interval Between Readings (Days)	KWH Per 30.4 Days	KWH Per 30.4 Days Last Month	diff (%)
100 Area Nr Bldg 111	1	2045	2796	2486	120	37200	37	30,564	28,576	7.0
300 Area Nr Bldg 321	2	8896	10975	9295	10	16800	37	13,803	13,852	-0.4
1300 Area Nr Bldg 1320	3	6219	4889	4766	1800	221400	37	181,907	182,400	-0.3
1400 Area Nr Bldg 1320	4	154	8649	8432	1200	260400	37	213,950	200,640	6.6
SB Substation-Ckt 20	5	1100	5326	4302	600	614400	34	549,346	769,728	-28.6
SB Substation-Ckt 21	6	1099	4189	2954	600	741000	33	682,618	525,920	29.8
SB Substation-Main	7	6184	8284	7870	32000	13248000	37	10,884,843	10,538,667	3.3
Solomon School	8	4729	8768	8683	160	13600	37	11,174	17,835	-37.3
Solomon School	9	7529	3331	3272	40	2360	37	1,939	2,473	-21.6
1300 Area Nr Bldg 1370	10	8897	4476	3117	10	13590	37	11,166	10,002	11.6
1900 Area Nr Bldg 1983	11	145	3819	3515	1200	364800	37	299,728	280,896	6.7
3000 Area Nr Bldg 3930	12	147	2102	1999	1200	123600	37	101,552	98,496	3.1
Area 1 UH Welding Shop	13	1879	1926	9212	1	0	37	0	344	-100.0
Area I UH Welding Shop	14	3470	582	578	100	400	37	329	203	62.1
[illegible] Area Nr Bldg T-822	15	6979	1465	1355	160	17600	37	14,461	15,078	-4.1
[illegible]rea Nr Ofc Club	16	6218	7891	7376	1800	927000	37	761,643	747,840	1.8
[illegible]ano Mil Res	17	8177	2781	2636	1000	145000	37	119,135	125,653	-5.2
3000 Area Nr Bldg 3611	18	6223	4526	3965	1200	673200	37	553,116	525,312	5.3
Commissary	19	1514	3847	3556	1200	349200	37	286,910	301,568	-4.9
First Hawaiian Bank	20	1545	6484	6340	40	5760	37	4,733	7,661	-38.2
SB Sewage Trtmt Plant	21	7178	1389	798	600	354600	37	291,347	214,624	35.7
WAFB Aviation Fac	22	4193	1417	1075	60	20520	37	16,860	20,003	-15.7
South Ramp WAFB	23	4734	95219	95219	1	0	37	0	65	-100.0
SFTS WAFB	24	807	6785	6147	80	51040	37	41,936	43,452	-3.5
SFTS WAFB	25	676	5585	5175	1	410	37	337	412	-18.2
Bldg 114 WAFB	26	3782	424	413	1	11	37	9	11	-18.2
Mauna Kapu	27	5041	5631	4776	1	855	37	702	855	-17.9
QUAD A	28	6971	8591	7538	240	252720	37	207,640	195,290	6.3
QUAD A	29	8004	9319	8688	160	100960	37	82,951	83,174	-0.3
Helemano, Bldg 300	30	2566	9991	9985	200	1200	37	986	2,027	-51.4
Kunia Tunnel	31	6611	958	594	4000	1456000	37	1,196,281	1,179,520	1.4
Area X	32	4550	756	713	1200	51600	37	42,396	37,696	12.5
Bldg T-300, WAFB	33	6093	2146	2121	120	3000	37	2,465	486	407.2
Bldg 1020,WAFB	34	8619	9647	9634	120	1560	37	1,282	973	31.8
							37			

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Schofield Barracks Family Housing Reimbursements

Month,CY : Jul-89 FY: 89

1. Public Housing 1970 & After (Cat N)

	Units Metered	Reading No.	KWH-Meas or Est.	Adj. Factor (Tot units/Mtrd units)		Billing Qty (KWH)	KWH/ Unit
FY71	208	Estimate	376480	215	208	389150	1810
FY72	208	11	364800	300	208	526154	1754
FY73	497	16	927000	640	497	1193722	1865

Total Cat (N) ******** 2109026 KWH X 0.07200 = $$$ 151849.87

2. Public Housing 1950-1969 - (Cat X) - Schofield Barracks (Rate A-FDA)

	Units Metered	Reading No.	KWH-Meas or Est.	Adj. Factor	Billing Qty (KWH)	KWH/ Unit
3000 Area	112	* 12	183008			1634
3000 Area	320	18	673200			2104
1400 Area	224	4	260400			1163
[illegible]+1400	492	Estimate	837456			1702
Sub-Total	1148		1954064	2140 /1148	3642593	1702

Sub-total 1 Cat (X) : 3642593 KWH X 0.07200 = $$$ 262266.70
(Rate A-FDA)

Location	Units Metered	KWH/Unit (Est)	Billing Qty(KWH)	Rate A (FDA)	Cost($)
Helemano	32	1702	54464	0.07200	3921.41

Sub-total 2 Cat (X) : 54464 KWH, $ 3921.41

Total Cat (X) ******** 3697057 KWH, $ 266188.11

3. Other Public Housing (Cat Y)

1872 KWH/Unit (Est) X 281 Units = 526032 X Rate A (FDA) 0.07200 = $$$ 37874.30

4. Sub-Standard Housing - KMC (Cat Z)

900 KWH/Unit (Est) X 6 Units = 5400 X Rate A (FDA) 0.07697 = $$$ 415.64

Total SB Family Housing	6337515	** $	456327.92
Total SB FH w/o KMC	6332115	** $	455912.28

Schofield Barracks Electric Meter Readings - Sheet 1

						(update every FY)	
Month,CY :	Aug-89	FY:	89	HECO fuel oil rate :	-0.02283	Rate A :	0.09210
Read'g dte:				HELCO fuel oil rate :	-0.01621	Rate B :	0.09710

Location	Reading No.	Meter No.	Present Reading	Previous Reading	Mult. Factor	Computed Consump. (KWH)	Interval Between Readings (Days)	KWH Per 30.4 Days	KWH Per 30.4 Days Last Month	diff (%)
100 Area Nr Bldg 111	1	2045	2983	2796	120	22440	24	28,424	30,564	-7.0
300 Area Nr Bldg 321	2	8896	1926	975	10	9510	24	12,046	13,803	-12.7
1300 Area Nr Bldg 1320	3	6219	4990	4889	1800	181800	24	230,280	181,907	26.6
1400 Area Nr Bldg 1320	4	154	8787	8649	1200	165600	24	209,760	213,950	-2.0
SB Substation-Ckt 20	5	900	0	0	2771	0	24	0	549,346	-100.0
SB Substation-Ckt 21	6	651	504	0	2771	1396584	24	1,769,006	682,618	159.2
SB Substation-Main	7	6184	8555	8284	32000	8672000	24	10,984,533	10,884,843	0.9
Solomon School	8	4729	8821	8768	160	8480	24	10,741	11,174	-3.9
Solomon School	9	7529	3373	3331	40	1680	24	2,128	1,939	9.7
1300 Area Nr Bldg 1370	10	8897	5330	4476	10	8540	24	10,817	11,166	-3.1
1900 Area Nr Bldg 1983	11	145	4002	3819	1200	219600	24	278,160	299,728	-7.2
3000 Area Nr Bldg 3930	12	147	2165	2102	1200	75600	24	95,760	101,552	-5.7
Area I UH Welding Shop	13	1879	2777	1926	1	851	24	1,078	0	0.0
Area I UH Welding Shop	14	3470	587	582	100	500	24	633	329	92.4
[illegible]ea Nr Bldg T-822	15	6979	1543	1465	160	12480	24	15,808	14,461	9.3
[illegible]rea Nr Ofc Club	16	6218	8314	7891	1800	761400	24	964,440	761,643	26.6
Helemano Mil Res	17	8177	2884	2781	1000	103000	24	130,467	119,135	9.5
3000 Area Nr Bldg 3611	18	6223	4870	4526	1200	412800	24	522,880	553,116	-5.5
Commissary	19	1514	4047	3847	1200	240000	24	304,000	286,910	6.0
First Hawaiian Bank	20	1545	6630	6484	40	5840	24	7,397	4,733	56.3
SB Sewage Trtmt Plant	21	7178	1617	1389	600	136800	24	173,280	291,347	-40.5
WAFB Aviation Fac	22	4193	1663	1417	60	14760	24	18,696	16,860	10.9
South Ramp WAFB	23	4734	95354	95219	1	135	24	171	0	0.0
SFTS WAFB	24	807	7208	6785	80	33840	24	42,864	41,936	2.2
SFTS WAFB	25	676	5875	5585	1	290	24	367	337	8.9
Bldg 114 WAFB	26	3782	433	424	1	9	24	11	9	22.2
Mauna Kapu	27	5041	6407	5631	1	776	17	1,388	702	97.7
QUAD A	28	6971	9258	8591	240	160080	24	202,768	207,640	-2.3
QUAD A	29	8004	9714	9319	160	63200	24	80,053	82,951	-3.5
Helemano, Bldg 300	30	2566	9999	9991	200	1600	24	2,027	986	105.6
Kunia Tunnel	31	6611	1200	958	4000	968000	24	1,226,133	1,196,281	2.5
Area X	32	4550	781	756	1200	30000	24	38,000	42,396	-10.4
Bldg T-300, WAFB	33	6093	2153	2146	120	840	24	1,064	2,465	-56.8
Bldg 1020,WAFB	34	8619	9670	9647	120	2760	24	3,496	1,282	172.7
							24			

APPENDIX C-3

CORRESPONDENCE

CEDRIC D. O. CHONG & ASSOCIATES, INC. • MECHANICAL & ELECTRICAL ENGINEERS

2130-E NORTH KING STREET • HONOLULU, HAWAII 96819 • PHONE: (808) 847-6557

SCH11-2.LET
P89037.02

November 2, 1989

Department of the Army
U.S. Army Engineering District, Honolulu
Military Branch
Fort Shafter, Hawaii 96858-5440

Attention: Mr. David Lindsey

Gentlemen:

Energy Savings Opportunity Survey (ESOS)
of Schofield Barracks Family Housing
Areas A, D, E, F, I, J, K-1

Attached is our tentative progress schedule for the completion of work for this project.

Please feel free to call us if you would like further clarification of our proposed schedule.

Sincerely,

Cedric D. O. Chong, P.E.
President

CDOC:fa

PROGRESS SCHEDULE

TASK		DATE
1.0	NOTICE TO PROCEED	September 25, 1989
2.0	INTERIM SUBMITTAL	Sept 25 - Jan 25, 1990
2.1	Entry Interview	December 4, 1989
2.2	Field Survey	December 5-28, 1989
2.3	Exit Interview	December 29, 1989
2.4	Analyze ECO's/Prepare Interim Report	Dec 29, 1989 - Jan 25, 1990
3.0	GOVERNMENT REVIEW	Jan 26 - Feb 26, 1990
4.0	PRE-FINAL SUBMITTAL	Feb 26 - Mar 30, 1900
5.0	GOVERNMENT REVIEW	Mar 30 - Apr 30, 1990
6.0	FINAL SUBMITTAL	Apr 30 - May 30, 1990

81-037.02

CEDRIC D. O. CHONG & ASSOCIATES, INC. • MECHANICAL & ELECTRICAL ENGINEERS

2130-E NORTH KING STREET • HONOLULU, HAWAII 96819 • PHONE: (808) 847-6557

December 5, 1989

Department of the Army
U.S. Army Engineering District, Honolulu
Military Branch
Fort Shafter, Hawaii 96858-5440

Attention: David Lindsey

Gentlemen:

Energy Savings Opportunity Survey (ESOS)
of Schofield Barracks Family Housing
Areas A, D, E, F, I, J, K-1

Attached is our proposed schedule for the field survey of the family housing.

Please feel free to call us if you would like to change any of the survey dates.

Sincerely,

Joel Yuen

Joel Yuen, P.E.

LK:fa

BUILDING	TYPE	APARTMENT	BEDROOMS	STORIES	AREA	SCHEDULED DATE FOR SURVEY
49	32-I		2	1	A	12/11/89
50						MONDAY
51						
52						
53						
54						
55						
56						
57						
58						
60						
61	32-II		2	1	A	12/11/89
62						MONDAY
63						
64						
65						
66						
71						
72						
73						
74						
75						
81	71-I	A,B	4	1	A	12/12/89
83		A,B				TUESDAY
85						
410	20-II		4	1	D	12/12/89
425						TUESDAY
426						
441						
442						
510					E	
525						
526						
542						
701					I	
712						
713						
724						
735						

BUILDING	TYPE	APARTMENT	BEDROOMS	STORIES	AREA	SCHEDULED DATE FOR SURVEY
401	20-III		3	1	D	12/14/89
402	↓		↓	↓	↓	THURSDAY
403	↓		↓	↓	↓	↓
404	↓		↓	↓	↓	↓
405	↓		↓	↓	↓	↓
406	↓		↓	↓	↓	↓
407	↓		↓	↓	↓	↓
408	↓		↓	↓	↓	↓
411	↓		↓	↓	↓	↓
412	↓		↓	↓	↓	↓
413	↓		↓	↓	↓	↓
414	↓		↓	↓	↓	↓
415	↓		↓	↓	↓	↓
416	↓		↓	↓	↓	↓
417	↓		↓	↓	↓	↓
418	↓		↓	↓	↓	↓
409	57-I	A,B	2	1	D	12/14/89
802	↓	↓	↓	↓	↓ J	THURSDAY
814	↓	↓	↓	↓	↓ ↓	↓
835	↓	↓	↓	↓	↓ ↓	↓
509	20-VI		5	1	E	12/15/89
601	32-III		3	1	F	12/15/89
603	↓		↓	↓	↓	FRIDAY
605	↓		↓	↓	↓	↓
607	↓		↓	↓	↓	↓
609	↓		↓	↓	↓	↓
611	↓		↓	↓	↓	↓
613	↓		↓	↓	↓	↓
614	↓		↓	↓	↓	↓
615	↓		↓	↓	↓	↓
616	↓		↓	↓	↓	↓
617	↓		↓	↓	↓	↓
618	↓		↓	↓	↓	↓
619	↓		↓	↓	↓	↓
621	↓		↓	↓	↓	↓
622	↓		↓	↓	↓	↓
623	↓		↓	↓	↓	↓
600	32-IV		4	1	F	12/15/89
602	↓		↓	↓	↓	FRIDAY
604	↓		↓	↓	↓	↓
606	↓		↓	↓	↓	↓
608	↓		↓	↓	↓	↓
610	↓		↓	↓	↓	↓
612	↓		↓	↓	↓	↓
620	↓		↓	↓	↓	↓
633	↓		↓	↓	↓	↓

BUILDING	TYPE	APARTMENT	BEDROOMS	STORIES	AREA	SCHEDULED DATE FOR SURVEY
803	20-IV		3	1	J	12/18/89
804						MONDAY
805						
806						
807						
808						
809						
816						
817						
818						
819						
820						
821						
822						
823						
824	↓		↓	↓	↓	↓
810	20-V	A,B	2	1	J	12/18/89
811						MONDAY
830						
831						
832						
833						
844	↓	↓	↓	↓	↓	↓
802	57-I	A,B	2	1	J	12/19/89
814						TUESDAY
835	↓	↓	↓	↓	↓	↓
3401	57-II	A,B	3	2	K-1	12/19/89
3402						TUESDAY
3405						
3406						
3410						
3411						
3413						
3414	↓	↓	↓	↓	↓	↓
3403	57-III	A,B	3	1	K-1	12/20/89
3409						TUESDAY
? 3418						
3419						
3423						
3508						
3515						
? 3518	↓	↓	↓	↓	↓	↓

BUILDING	TYPE	APARTMENT	BEDROOMS	STORIES	AREA	SCHEDULED DATE FOR SURVEY
3427	57-IV	A,B,C,D	3	2	K-1	12/20/89
3432		A,B,C,D				WEDNESDAY
3433		B,C				
3434		B,C				
3436		B,C				
3438	↓	B,C	↓	↓	↓	↓
3903	57-IX	A,B,C,D	3	2	K-1	12/21/89
3908						THURSDAY
3909						
3910	↓	↓	↓	↓	↓	↓
3427	57-V	E	2	1	K-1	12/21/89
3432		E				THURSDAY
3433		A,D				
3434		A,D				
3436		A,D				
3438		A,D				
3440		A				
3442		A,D				
3444		E				
3445	↓	A,D	↓	↓	↓	↓
3430	57-VI	A,B,C,D	3	2	K-1	12/22/89
3608						FRIDAY
3704						
3713	↓	↓	↓	↓	↓	↓
3900	57-VII	A	2	1	K-1	12/22/89
3904		A				FRIDAY
3905		E				
3913		A				
3914		E				
3916	↓	A	↓	↓	↓	↓
3900	57-VIII	B,C,D,E	3	2	K-1	12/26/89
3904		B,C,D,E				TUESDAY
3905		A,B,C,D				
3913	↓	B,C,D,E	↓	↓	↓	↓
3917	60-I	A,B,C,D	2	2	K-1	12/26/89
3924						TUESDAY
3934						
3935	↓	↓	↓	↓	↓	↓
3922	60-II	A,B,C,D	4	2	K-1	12/27/89
3933						WEDNESDAY
3936						
3939	↓	↓	↓	↓	↓	↓

BUILDING	TYPE	APARTMENT	BEDROOMS	STORIES	AREA	SCHEDULED DATE FOR SURVEY
3918	60-III	A,B,C,D	3	2	K-1	12/27/89
3919	|	|	|	|	|	WEDNESDAY
3920	|	|	|	|	|	|
3921	↓	↓	↓	↓	↓	↓

CEDRIC D. O. CHONG & ASSOCIATES, INC. • MECHANICAL & ELECTRICAL ENGINEERS

2130-E NORTH KING STREET • HONOLULU, HAWAII 96819 • PHONE: (808) 847-6557

esos.mtg
89-037.02

MEETING MEMORANDUM

Date: December 8, 1989

Project: Schofield Barracks Family Housing ESOS

Subject: Entry Meeting

Attendees:

Name	Organization	Phone No.
David Lindsey	CEPOD-ED-MI	438-6938
Joel Yuen	Cedric Chong & Assoc.	847-6557
Linda Koyanagi	Cedric Chong & Assoc.	847-6557
James Kenolo	OCFHO-SB	655-0642/8943

The following is a summary of items discussed and actions to be taken:

1) The troops will be working on a Christmas schedule starting December 20, 1989. Due to the holiday season it will be inconvenient for the survey to take place during this time. The field work shall be rescheduled to begin on January 8, 1990 and to finish by January 26, 1989.

   The submittal dates for the study shall be revised to to accommodate the delay in the field work. A new schedule is attached for review & approval by the Corps of Engineers and OCFHO-SB.

2) The survey schedule includes sixteen units of each type to ensure an adequate sampling. Only the first six open units of each type available for inspection will actually be surveyed.

3) The survey shall consist of a short interview of the house resident, taking nameplate data on equipment & appliances, and taking measurements of hot water temperatures, flow rates, lighting levels, equipment amperages, etc. Housing occupants will not be required to move or lift furniture. The time required to survey each unit will be approximately half an hour.

4) Light Fixtures - Some of the unit types have high ceilings and will require the use of 6' ladders to reach the light fixtures (Bldgs 410 through 835), the other unit ceilings can be accessed using a 4' stepladder. Both ladders may be borrowed from OCFHO-SB. The lamps for fluorescent light fixtures are provided by the Government, incandescent light bulbs are provided by the resident.

5) There are no existing water flow restrictors provided on fixtures.

6) Central air conditioning provided in some of the officer's quarters have been disconnected to save energy. All air conditioning is now provided by the occupant (window units).

7) The following appliances are provided by the Government: washers, dryers, refrigerators, ranges, dishwashers (either built-in or portable), and garbage disposals. The unit types with high ceilings do not have range hoods (Bldgs 410 through 835). All units have existing heat pumps, but some are not working and have been disconnected. None of the units to be surveyed have any gas appliances.

8) Electricity - The Government pays for all electrical bills. Metering is done by areas, not by individual units. The Corps of Engineers will have James Dati provide additional information on how electricity is billed. 655-2517

9) The survey shall be conducted between the hours of 9:00 am to 12:00 pm and 1:00 pm to 4:00 pm. Our business card shall be presented to the resident as identification. One team made up of 2 persons shall be conducting the survey. Names and other information on the survey personnel were presented to the PDE.

10) Unit type floor plans were provided by OCFHO-SB. Mechanical and electrical as-builts can be obtained at Wheeler Air Force Base, Bldg 113 (DFE).

Respectfully Submitted,

Joel Yuen, P.E.
Vice-President

LK:lk

PROGRESS SCHEDULE (REVISED)

TASK		DATE
1.0	NOTICE TO PROCEED	September 25, 1989
2.0	INTERIM SUBMITTAL	Sept 25, 1989 - Jan 25, 1990
2.1	Entry Interview	December 8, 1989
2.2	Field Survey	Jan 8-25, 1990
2.3	Exit Interview	January 25, 1990
2.4	Analyze ECO's/Prepare Interim Report	Jan 26 - Feb 26, 1990
3.0	GOVERNMENT REVIEW	Feb 26 - Mar 26, 1990
4.0	PRE-FINAL SUBMITTAL	Mar 26 - Apr 30, 1990
5.0	GOVERNMENT REVIEW	Apr 30 - May 30, 1990
6.0	FINAL SUBMITTAL	May 30 - June 30, 1990

BUILDING	TYPE	APARTMENT	BEDROOMS	STORIES	AREA	SCHEDULED DATE FOR SURVEY
49	32-I		2	1	A	1/8/90
50						MONDAY
51						
52						
53						
54						
55						
56						
57						
58						
60						
61	32-II		2	1	A	1/8/90
62						MONDAY
63						
64						
65						
66						
71						
72						
73						
74						
75						
81	71-I	A,B	4	1	A	1/9/90
83		A,B				TUESDAY
85						
410	20-II		4	1	D	1/9/90
425						TUESDAY
426						
441						
442						
510					E	
525						
526						
542						
701					I	
712						
713						
724						
735						

BUILDING	TYPE	APARTMENT	BEDROOMS	STORIES	AREA	SCHEDULED DATE FOR SURVEY
401	20-III		3	1	D	1/10/90
402	|		|	|	|	WEDNESDAY
403	|		|	|	|	|
404	|		|	|	|	|
405	|		|	|	|	|
406	|		|	|	|	|
407	|		|	|	|	|
408	|		|	|	|	|
411	|		|	|	|	|
412	|		|	|	|	|
413	|		|	|	|	|
414	|		|	|	|	|
415	|		|	|	|	|
416	|		|	|	|	|
417	|		|	|	|	|
418	↓		↓	↓	↓	↓
409	57-I	A,B	2	1	J	1/10/90
802	|	|	|	|	|	WEDNESDAY
814	|	|	|	|	|	|
835	↓	↓	↓	↓	↓	↓
509	20-VI		5	1	E	1/11/90
						THURSDAY
601	32-III		3	1	F	1/11/90
603	|		|	|	|	THURSDAY
605	|		|	|	|	|
607	|		|	|	|	|
609	|		|	|	|	|
611	|		|	|	|	|
613	|		|	|	|	|
614	|		|	|	|	|
615	|		|	|	|	|
616	|		|	|	|	|
617	|		|	|	|	|
618	|		|	|	|	|
619	|		|	|	|	|
621	|		|	|	|	|
622	|		|	|	|	|
623	↓		↓	↓	↓	↓
600	32-IV		4	1	F	1/11/90
602	|		|	|	|	THURSDAY
604	|		|	|	|	|
606	|		|	|	|	|
608	|		|	|	|	|
610	|		|	|	|	|
612	|		|	|	|	|
620	|		|	|	|	|
633	↓		↓	↓	↓	↓

BUILDING	TYPE	APARTMENT	BEDROOMS	STORIES	AREA	SCHEDULED DATE FOR SURVEY
803	20-IV		3	1	J	1/12/90
804	↓		↓	↓	↓	FRIDAY
805	↓		↓	↓	↓	↓
806	↓		↓	↓	↓	↓
807	↓		↓	↓	↓	↓
808	↓		↓	↓	↓	↓
809	↓		↓	↓	↓	↓
816	↓		↓	↓	↓	↓
817	↓		↓	↓	↓	↓
818	↓		↓	↓	↓	↓
819	↓		↓	↓	↓	↓
820	↓		↓	↓	↓	↓
821	↓		↓	↓	↓	↓
822	↓		↓	↓	↓	↓
823	↓		↓	↓	↓	↓
824	↓		↓	↓	↓	↓
810	20-V	A,B	2	1	J	1/12/90
811	↓	↓	↓	↓	↓	FRIDAY
830	↓	↓	↓	↓	↓	↓
831	↓	↓	↓	↓	↓	↓
832	↓	↓	↓	↓	↓	↓
833	↓	↓	↓	↓	↓	↓
844	↓	↓	↓	↓	↓	↓
802	57-I	A,B	2	1	J	1/15/90
814	↓	↓	↓	↓	↓	MONDAY
835	↓	↓	↓	↓	↓	↓
3401	57-II	A,B	3	2	K-1	1/15/90
3402	↓	↓	↓	↓	↓	MONDAY
3405	↓	↓	↓	↓	↓	↓
3406	↓	↓	↓	↓	↓	↓
3410	↓	↓	↓	↓	↓	↓
3411	↓	↓	↓	↓	↓	↓
3413	↓	↓	↓	↓	↓	↓
3414	↓	↓	↓	↓	↓	↓
3403	57-III	A,B	3	1	K-1	1/16/90
3409	↓	↓	↓	↓	↓	TUESDAY
3418	↓	↓	↓	↓	↓	↓
3419	↓	↓	↓	↓	↓	↓
3423	↓	↓	↓	↓	↓	↓
3508	↓	↓	↓	↓	↓	↓
3515	↓	↓	↓	↓	↓	↓
3518	↓	↓	↓	↓	↓	↓

BUILDING	TYPE	APARTMENT	BEDROOMS	STORIES	AREA	SCHEDULED DATE FOR SURVEY
3427	57-IV	A,B,C,D	3	2	K-1	1/16/90
3432	│	A,B,C,D	│	│	│	TUESDAY
3433	│	B,C	│	│	│	│
3434	│	B,C	│	│	│	│
3436	│	B,C	│	│	│	│
3438	↓	B,C	↓	↓	↓	↓
3903	57-IX	A,B,C,D	3	2	K-1	1/17/90
3908	│	│	│	│	│	WEDNESDAY
3909	│	│	│	│	│	│
3910	↓	↓	↓	↓	↓	↓
3427	57-V	E	2	1	K-1	1/17/90
3432	│	E	│	│	│	WEDNESDAY
3433	│	A,D	│	│	│	│
3434	│	A,D	│	│	│	│
3436	│	A,D	│	│	│	│
3438	│	A,D	│	│	│	│
3440	│	A	│	│	│	│
3442	│	A,D	│	│	│	│
3444	│	E	│	│	│	│
3445	↓	A,D	↓	↓	↓	↓
3430	57-VI	A,B,C,D	3	2	K-1	1/18/90
3608	│	│	│	│	│	THURSDAY
3704	│	│	│	│	│	│
3713	↓	↓	↓	↓	↓	↓
3900	57-VII	A	2	1	K-1	1/18/90
3904	│	A	│	│	│	THURSDAY
3905	│	E	│	│	│	│
3913	│	A	│	│	│	│
3914	│	E	│	│	│	│
3916	↓	A	↓	↓	↓	↓
3900	57-VIII	B,C,D,E	3	2	K-1	1/19/90
3904	│	B,C,D,E	│	│	│	FRIDAY
3905	│	A,B,C,D	│	│	│	│
3913	│	B,C,D,E	│	│	↓	↓
3917	60-I	A,B,C,D	2	2	K-1	1/19/90
3924	│	│	│	│	│	FRIDAY
3934	│	│	│	│	│	│
3935	↓	↓	↓	↓	↓	↓
3922	60-II	A,B,C,D	4	2	K-1	1/22/90
3933	│	│	│	│	│	MONDAY
3936	│	│	│	│	│	│
3939	↓	↓	↓	↓	↓	↓

BUILDING	TYPE	APARTMENT	BEDROOMS	STORIES	AREA	SCHEDULED DATE FOR SURVEY
3918	60-III	A,B,C,D	3	2	K-1	1/22/90
3919	|	|	|	|	|	MONDAY
3920	|	|	|	|	|	|
3921	↓	↓	↓	↓	↓	↓

Security Clearance Information for Schofield Barracks ESOS Field Surveyors

NAME	[redacted]	[redacted]
1. Joel Yuen	[redacted]	[redacted]
2. Linda Koyanagi	[redacted]	[redacted]
PII Redacted 3. Joseph Nguyen	[redacted]	[redacted]
4. Greffin Asprec	[redacted]	[redacted]
5. Rick Espinosa	[redacted]	[redacted]

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CEDRIC D.O. CHONG & ASSOCIATES, INC.
CONSULTING MECHANICAL AND ELECTRICAL ENGINEERS
2130-E North King Street, Honolulu, Hawaii 96819-4527
Phone: (808) 847-6557 Telefax: (808) 847-6550

DATE: 2/16/90 TIME SENT: 3:45pm CDOCA JOB NO. 89-037.02
TO: David Lindsey
AT: CEPOD-ED-MI FAX NO.
FROM: Joel Yuen TOTAL PGS. INCL THIS: 1
RE: ESOS Study @ Schofield Barracks

IN ADDITION TO THE ITEMS PREVIOUSLY REQUESTED WE WOULD LIKE THE FOLLOWING INFORMATION:

1) Wattages/Voltages of fixtures used for street lighting in Areas A, D, E, F, I, J, K-1

2) Type of lamps used (Metal Halide, Low Pressure Sodium, Incadescent, etc.)

3) Type of circuit - series or parallel

4) Minimum Lighting level required
   a) foot candle on street
   b) foot candle at intersection

Vov
Discoun

RUN DATE 01/08/90 HECO CUSTOMER CONSUMPTION AND BILLING HISTORY MK32R1 AS OF 12/31/89

ACCOUNT NUMBER	RATE	BUS CODE	YEAR TO DATE	1988	1989	12 MO. ENDING	12/31/88	12/31/89
71-983-905-75	P	972						
			HIGH KW	19200.0	20160.0	HIGH KW	19200.0	20160.0
NAME / ADDRESS	DISCOUNT / SURCHARGE		LOW KW	16640.0	17600.0	LOW KW	16640.0	17600.0
USA DFE ITEM A11	3.3TP		AVG KW	18400.0	19066.7	AVG KW	18400.0	19066.7
HQ USASCH (ITEM A-11)	METER NUMBER		AVG KWH/MO	9970667	10410667	AVG KWH/MO	9970667	10410667
FT SHAFTER HI 96858	KWH	RKVAH	AVG KWH/KW	541.4	547.3	AVG KWH/KW	541.4	547.3
	386184	385371						
SERVICE ADDRESS			TOTAL KWH	119648000	124928000	TOTAL KWH	119648000	124928000
1641 WILIKINA DR	MULTIPLIER 32000		TOTAL NET BILL $	6269020.44	6989616.22	TOTAL NET BILL $	6269020.44	6989616.22
			AVG KWH COST $	0.052	0.056	AVG KWH COST $	0.052	0.056

up 4%

load factor

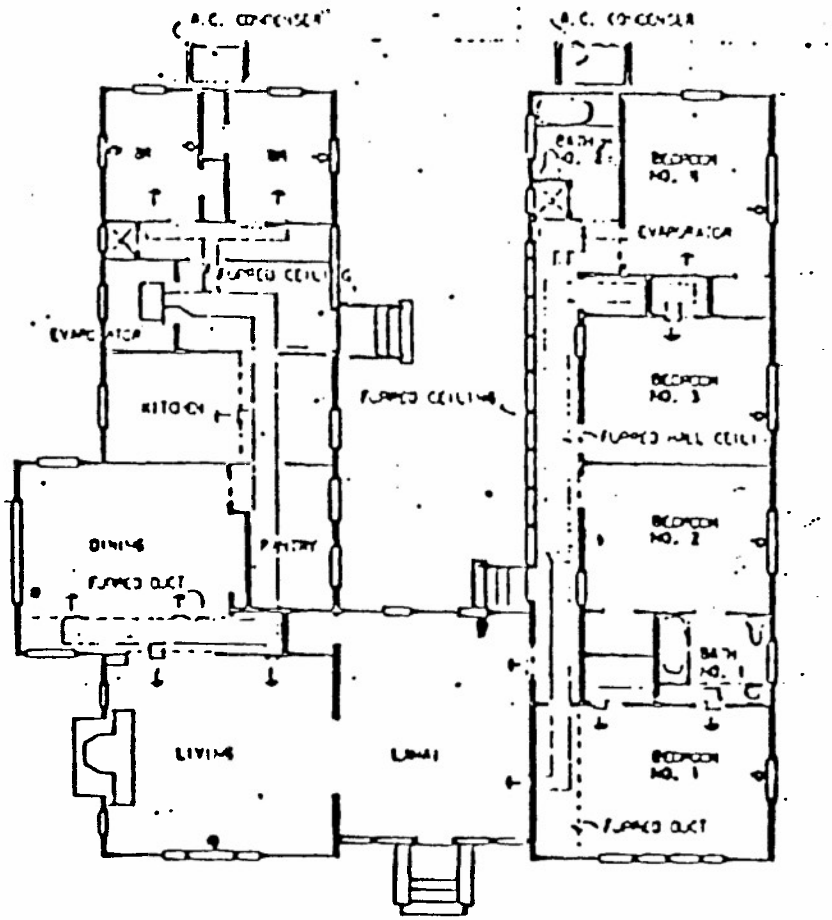
BILL DATE	BILL DAYS	PWR FCTR %	MEASRD DMD KW	BILL DMD KW	ENERGY USAGE KWH	DEMAND CHARGE $	ENERGY CHARGE $	DISCOUNT/ SURCHARGE $	POWER FACTOR ADJ. $	FUEL OIL ADJ. $	NET BILL $	KWH USE PER DAY	KWH/KW NORMALIZED 30.4 DAYS
1/29/88	29	93.0	17280.0	18400.0	8864000	102900.00	671555.97	25709.99-	6232.73-	191844.47-	550668.78	305655.2	537.7
3/01/88	32	93.0	17600.0	18560.0	9728000	103780.00	730833.54	27711.39-	6717.91-	241187.52-	558996.72	304000.0	525.1
3/30/88	29	93.0	16640.0	18080.0	8704000	101140.00	659486.85	25250.63-	6121.37-	226739.20-	502515.65	300137.9	549.3
4/29/88	30	93.0	16960.0	18240.0	8992000	102020.00	679647.10	25950.36-	6291.00-	240239.26-	509186.48	299733.3	537.3
5/31/88	32	92.0	18880.0	19200.0	10206000	107300.00	765837.70	28991.68-	6149.75-	324186.94-	513809.33	319000.0	513.6
6/29/88	29	90.0	19200.0	19360.0	10112000	108180.00	759919.74	28823.63-	4367.22-	321763.84-	513145.05	348689.7	557.1
7/29/88	30	90.0	18880.0	19200.0	10454000	107300.00	783223.17	29570.20-	4480.33-	324265.41-	532207.23	348000.0	561.6
8/30/88	32	90.0	19200.0	19360.0	11200000	108180.00	833808.00	31282.34-	4739.73-	363132.00-	542833.91	350000.0	555.7
9/29/88	30	90.0	19200.0	19200.0	10464000	107300.00	783223.17	29570.20-	4480.33-	357572.22-	508905.42	348800.0	552.3
10/31/88	32	91.0	19200.0	19200.0	11096000	107300.00	820167.30	30799.55-	5599.92-	350869.68-	540198.15	344050.0	545.7
12/01/88	31	92.0	19200.0	19200.0	10080000	107300.00	757144.96	28702.42-	6088.39-	313036.03-	516618.12	325161.3	514.8
12/30/88	29	92.0	18560.0	18830.0	9824000	105540.00	738536.29	28026.12-	5944.93-	330185.64-	479940.60	338758.6	554.9
CURRENT CALENDAR YEAR													
1/30/89	31	92.0	19200.0	19200.0	10368000	107300.00	776703.62	29353.26-	6276.45-	341445.00-	506979.91	334451.6	529.5
3/01/89	30	92.0	18560.0	18830.0	9920000	105540.00	743075.84	28243.06-	5990.95-	298135.68-	518246.15	330666.7	541.6
3/31/89	30	91.0	17600.0	18400.0	9344000	102900.00	704153.73	26794.72-	4871.77-	270882.56-	504504.68	311466.7	538.0
5/01/89	31	92.0	17920.0	18560.0	10240000	103780.00	765512.98	28868.43-	6123.61-	268420.13-	565880.81	330322.6	560.5
5/31/89	30	91.0	18240.0	18720.0	10048000	104660.00	750383.68	28483.43-	5176.81-	237132.80-	584248.64	334933.3	558.7
6/29/89	29	90.0	18880.0	19040.0	10016000	106420.00	749422.46	28508.40-	4319.53-	218649.28-	604364.85	345379.3	556.1
7/31/89	32	90.0	19840.0	19840.0	11136000	110820.00	828181.76	31284.39-	4740.06-	224435.64-	678541.67	348000.0	533.2
8/30/89	30	90.0	19200.0	19520.0	10752000	109060.00	801006.72	30318.82-	4593.76-	245468.16-	629685.98	358400.0	567.5
9/29/89	30	90.0	19840.0	19840.0	10976000	110820.00	817360.16	30922.81-	4685.27-	281881.97-	610590.12	365866.7	560.6
10/31/89	32	90.0	19840.0	19840.0	11488000	110820.00	851989.28	32079.85-	4860.58-	305954.16-	619714.69	359000.0	550.1
11/30/89	30	91.0	20160.0	20160.0	10656000	112560.00	796920.18	30297.45-	5504.65-	283556.16-	590137.92	355200.0	535.6
12/29/89	29	92.0	19520.0	19840.0	9984000	110820.00	750266.24	28681.05-	6083.66-	249899.52-	576421.81	344275.9	536.7

Abv. is good

% of bill
in sched. P

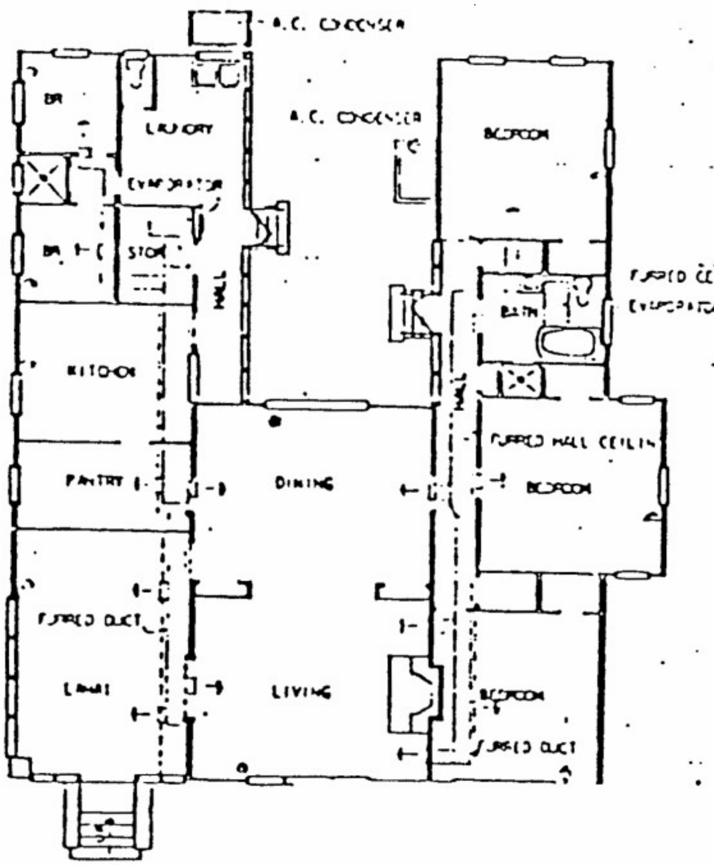
Improve station power factor at substation

Avg. 91



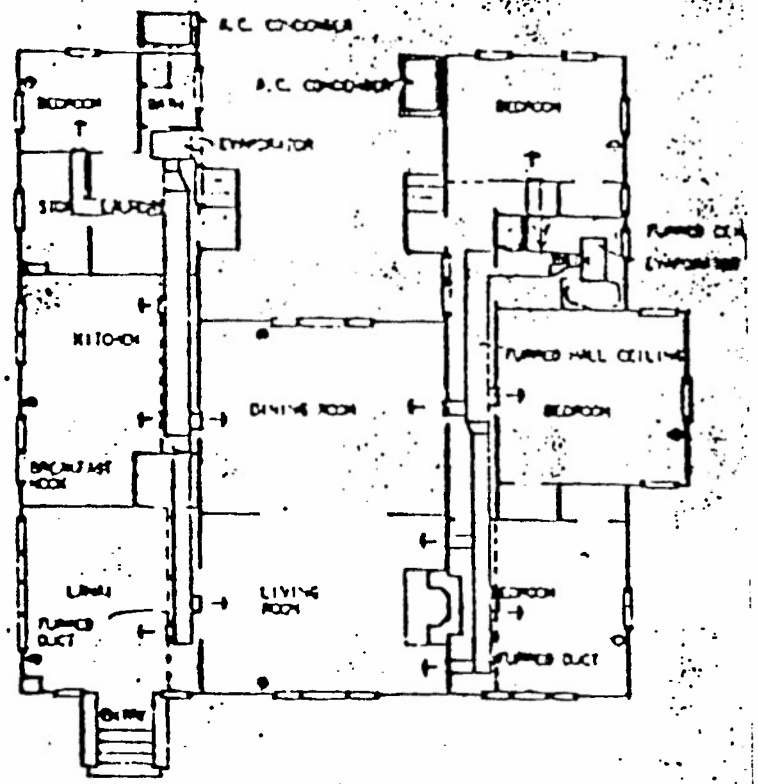
FLOOR PLAN
SCALE 1/8" = 1'-0"

UNIT TYPE 20-II

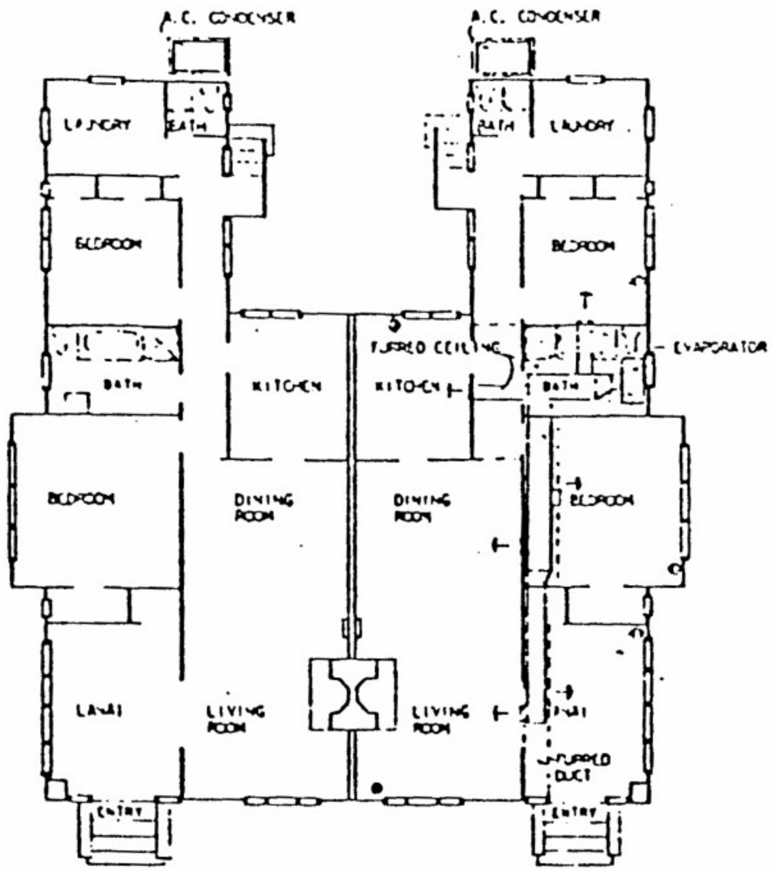


FLOOR PLAN
SCALE 1/8" = 1'-0"

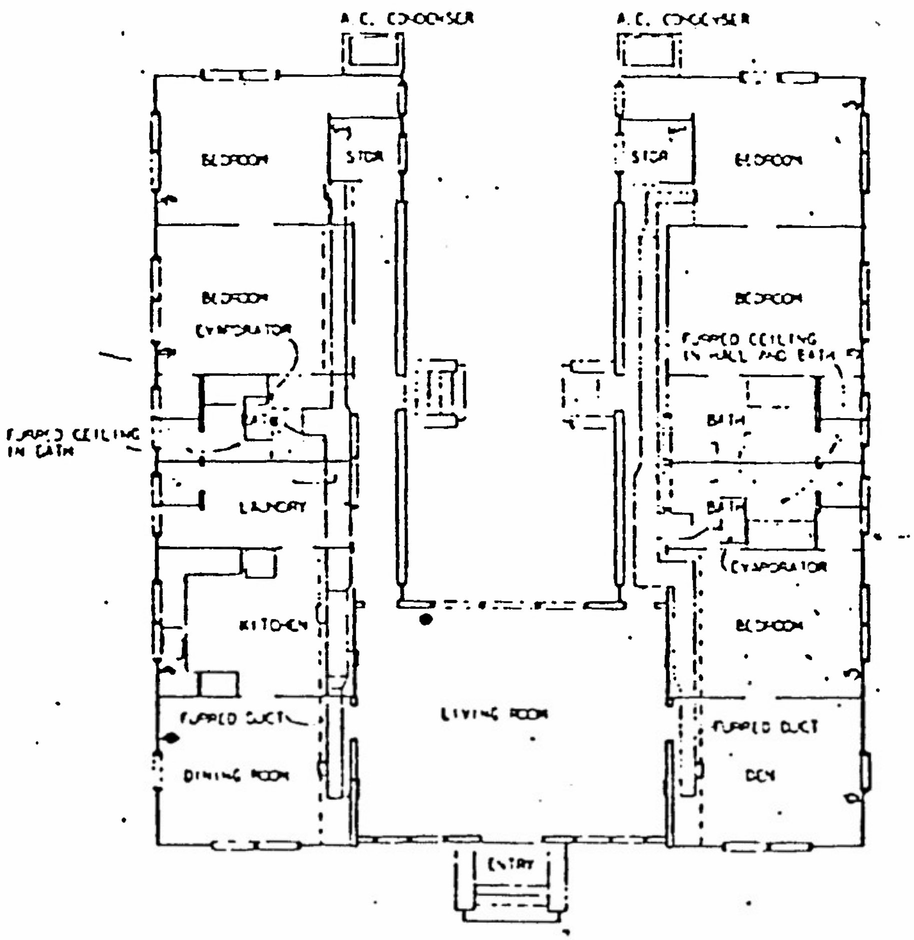
UNIT TYPE 20-III



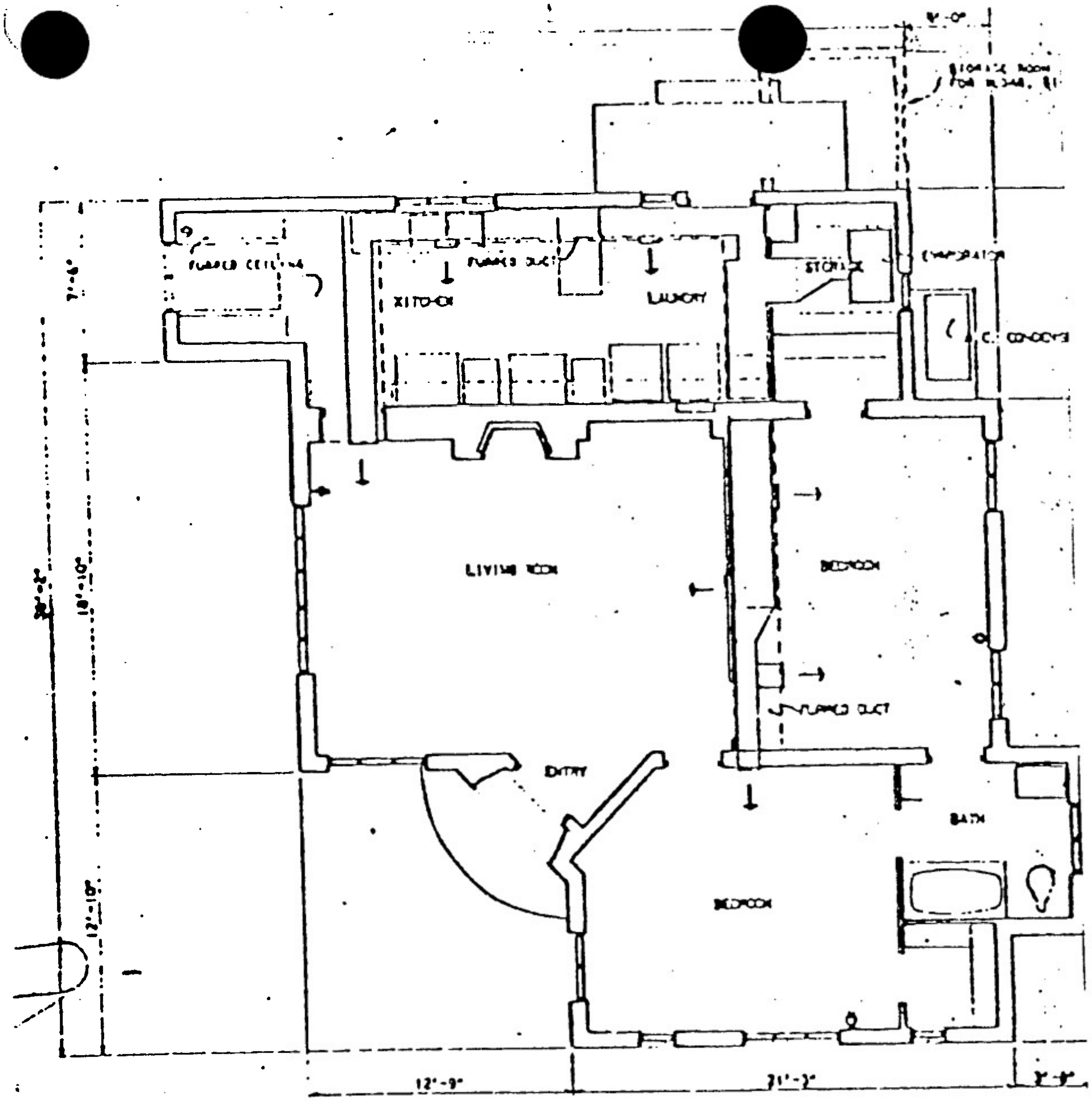
UNIT TYPE 20-IV



UNIT TYPE 20-V

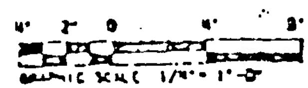


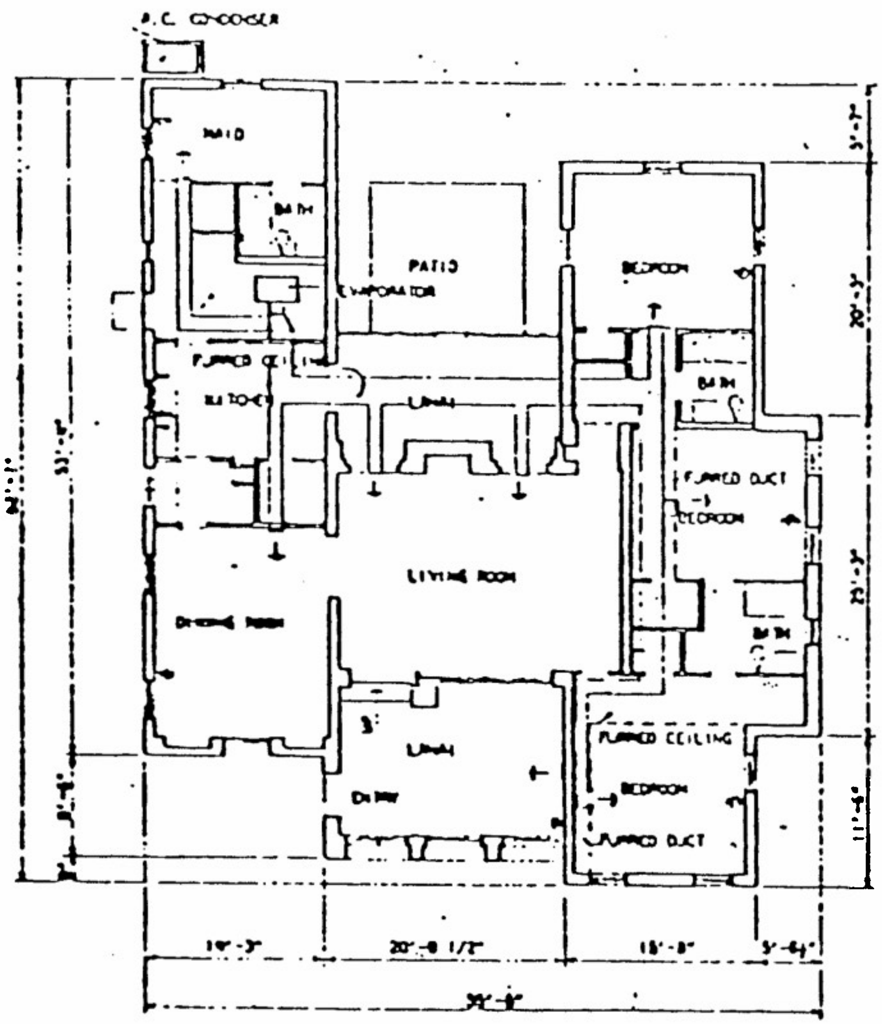
UNIT TYPE 20-VI



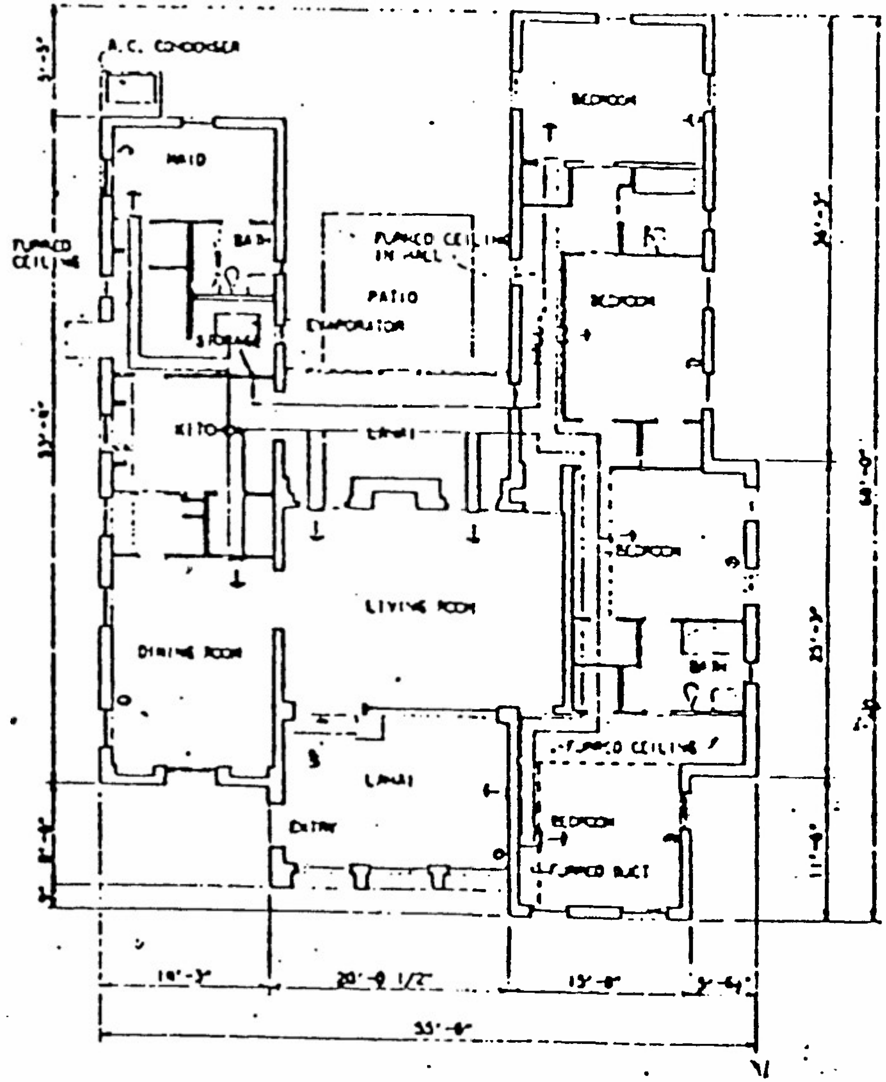
FLOOR PLAN
SCALE 1/4" = 1'-0"

UNIT TYPE 32-I & 32-II

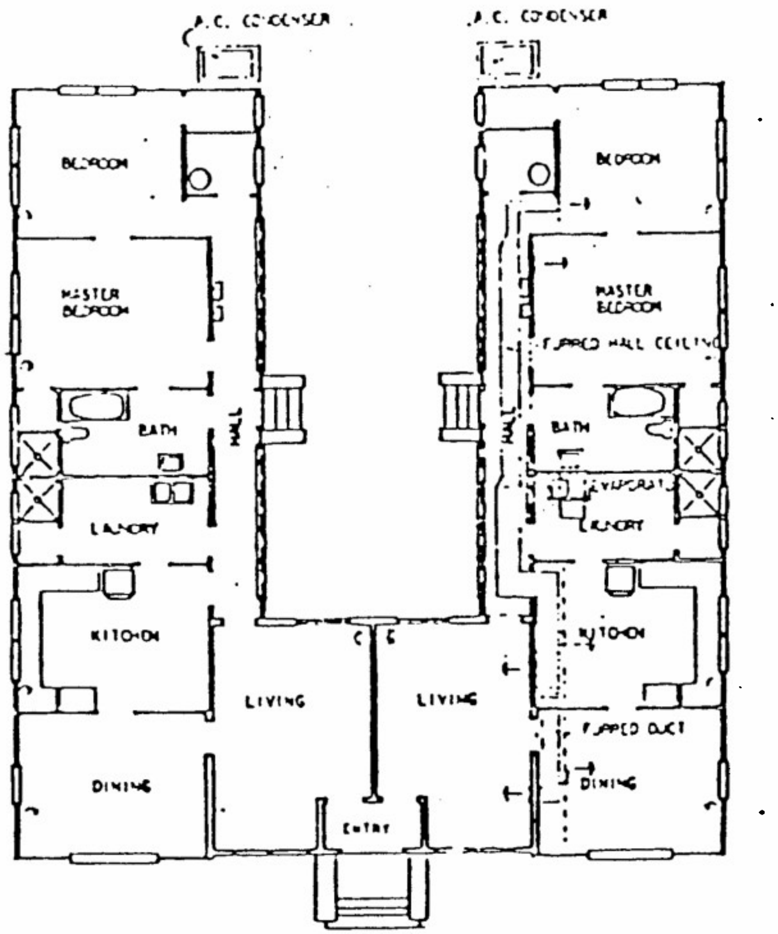




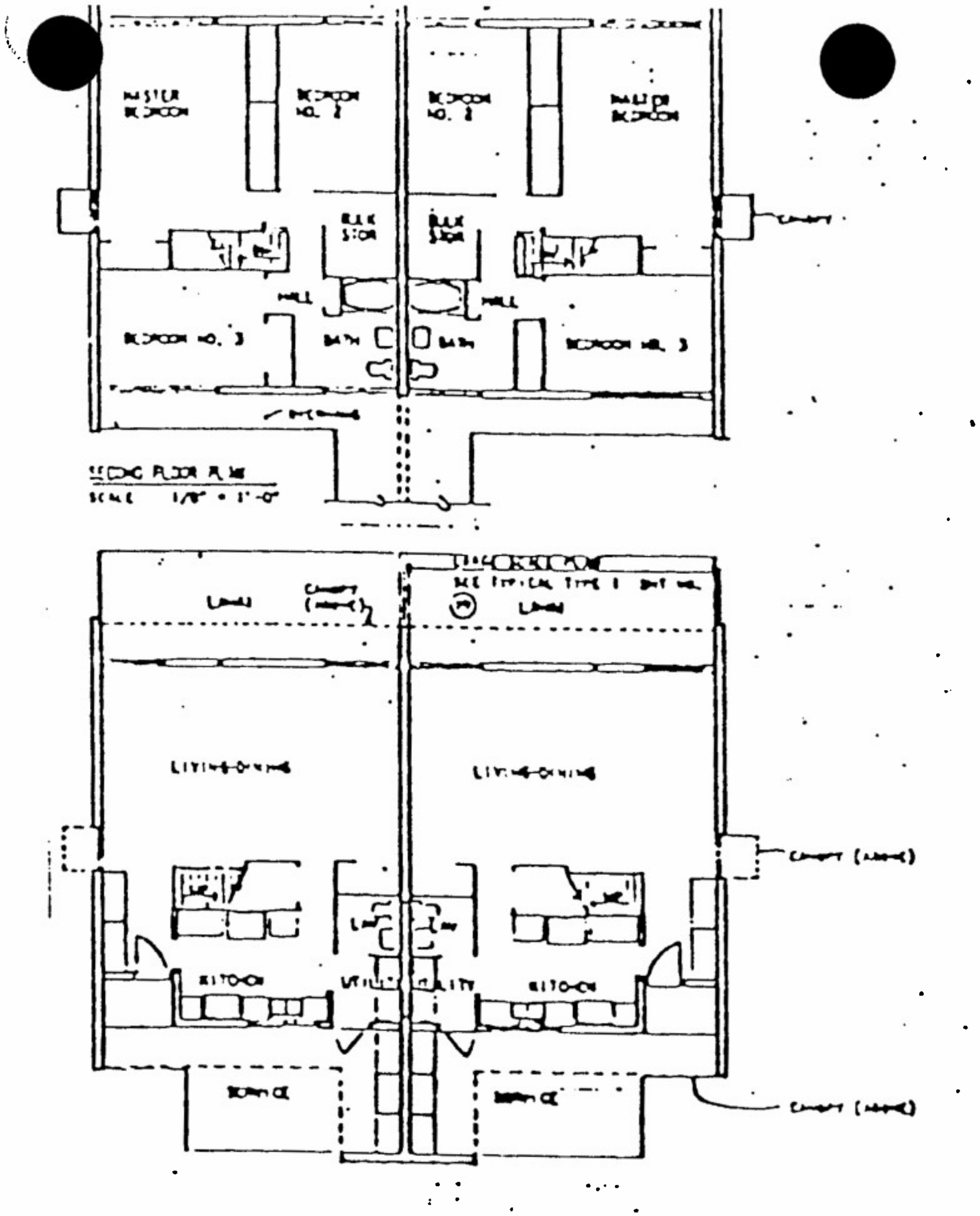
UNIT TYPE 32-III



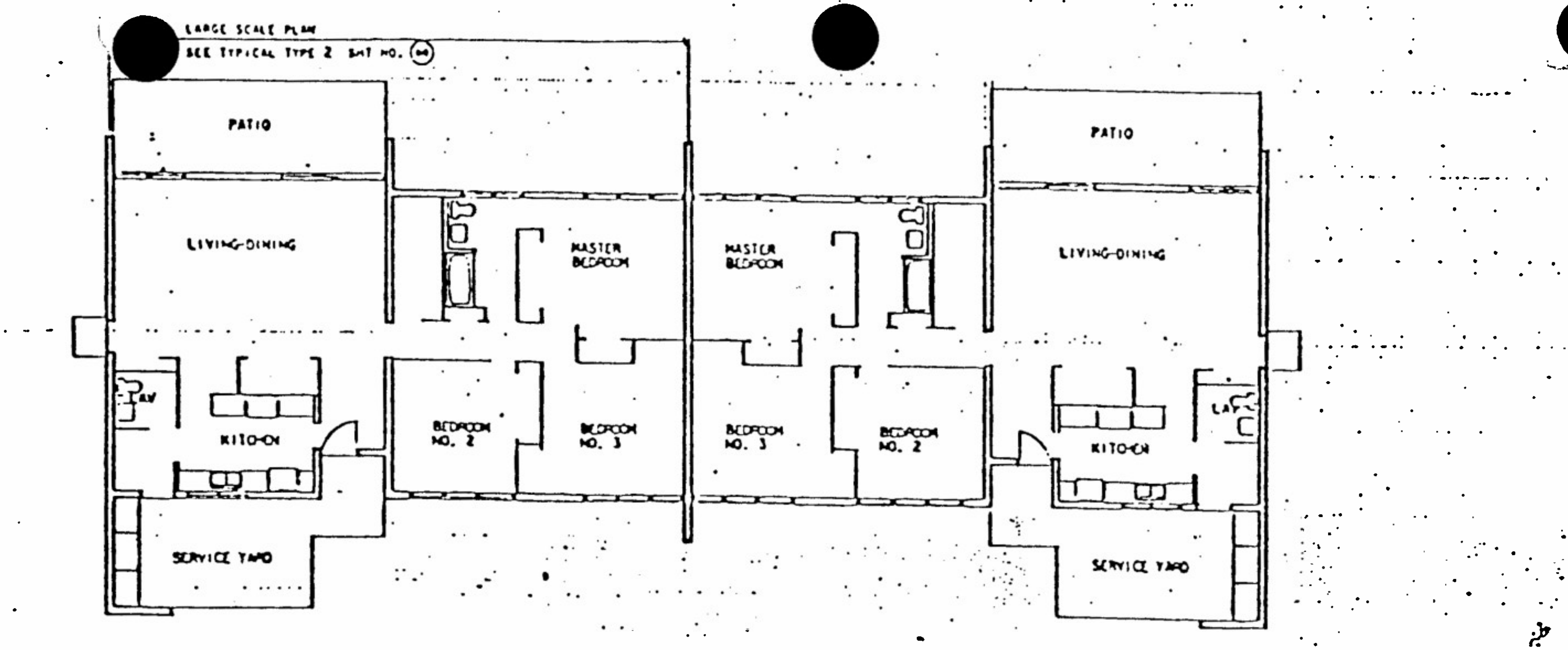
UNIT TYPE 32-IV



UNIT TYPE 57-I



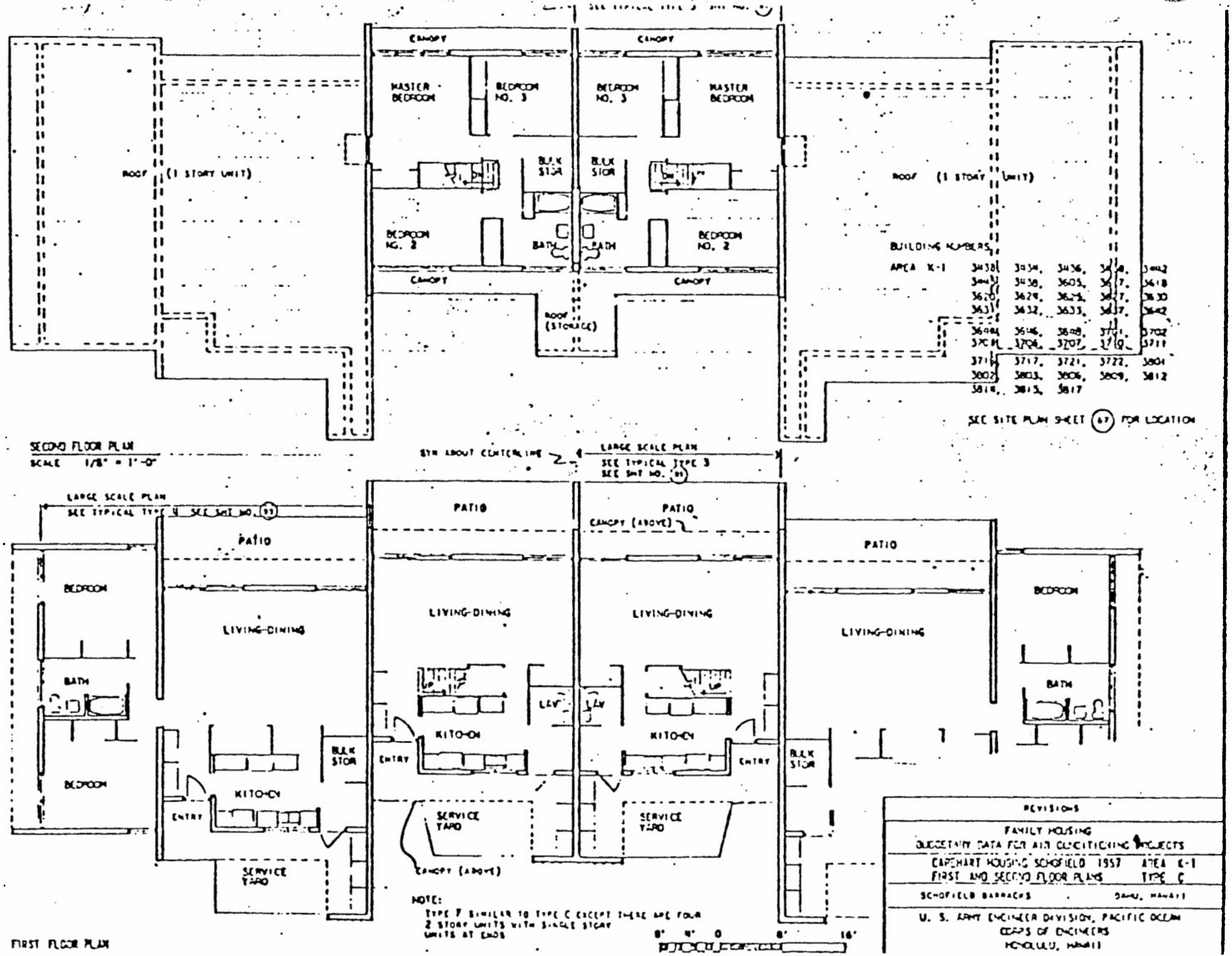
UNIT TYPE 57-II

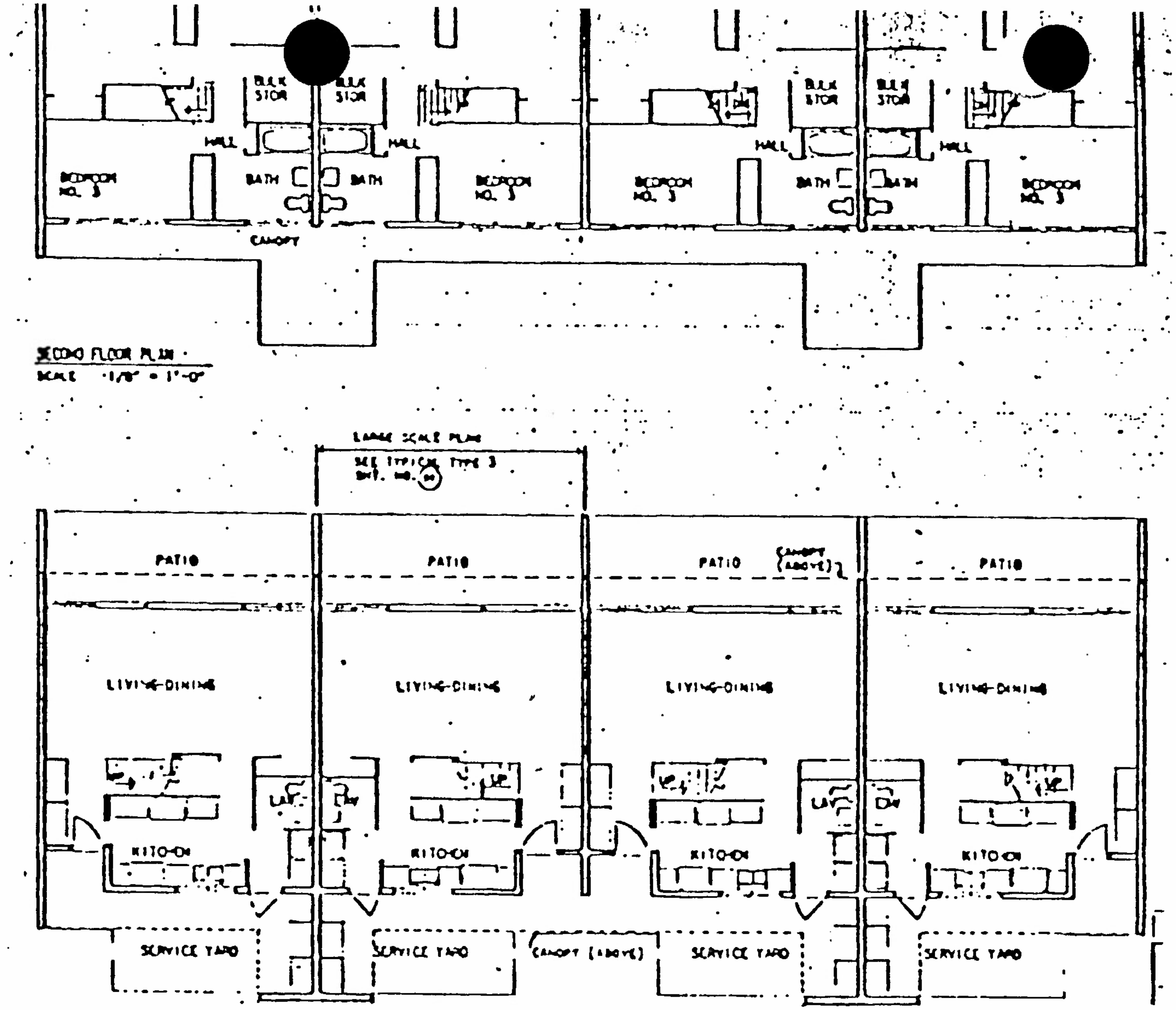


UNIT TYPE 57-III

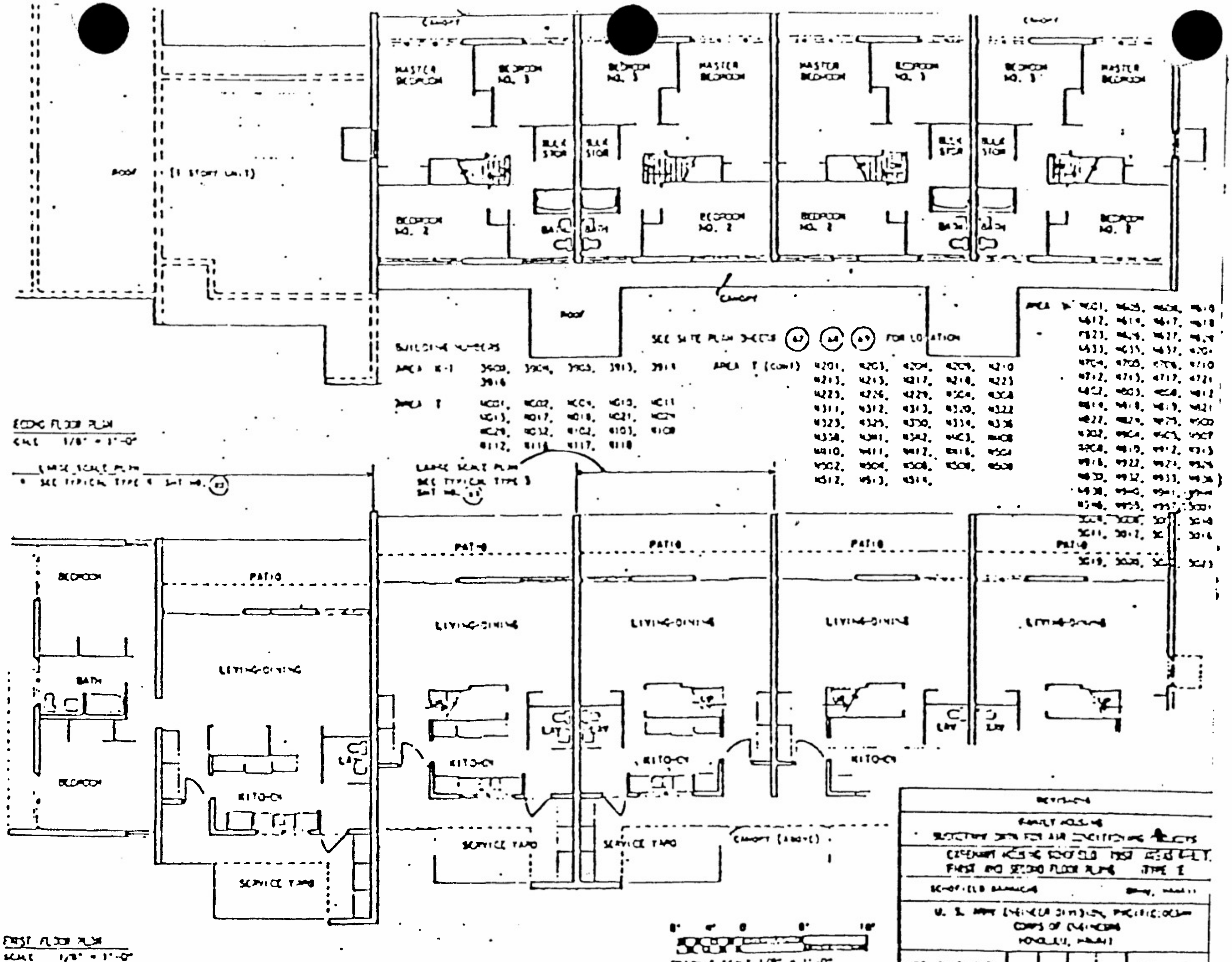
UNIT TYPE 57-iv

UNIT TYPE 57-V



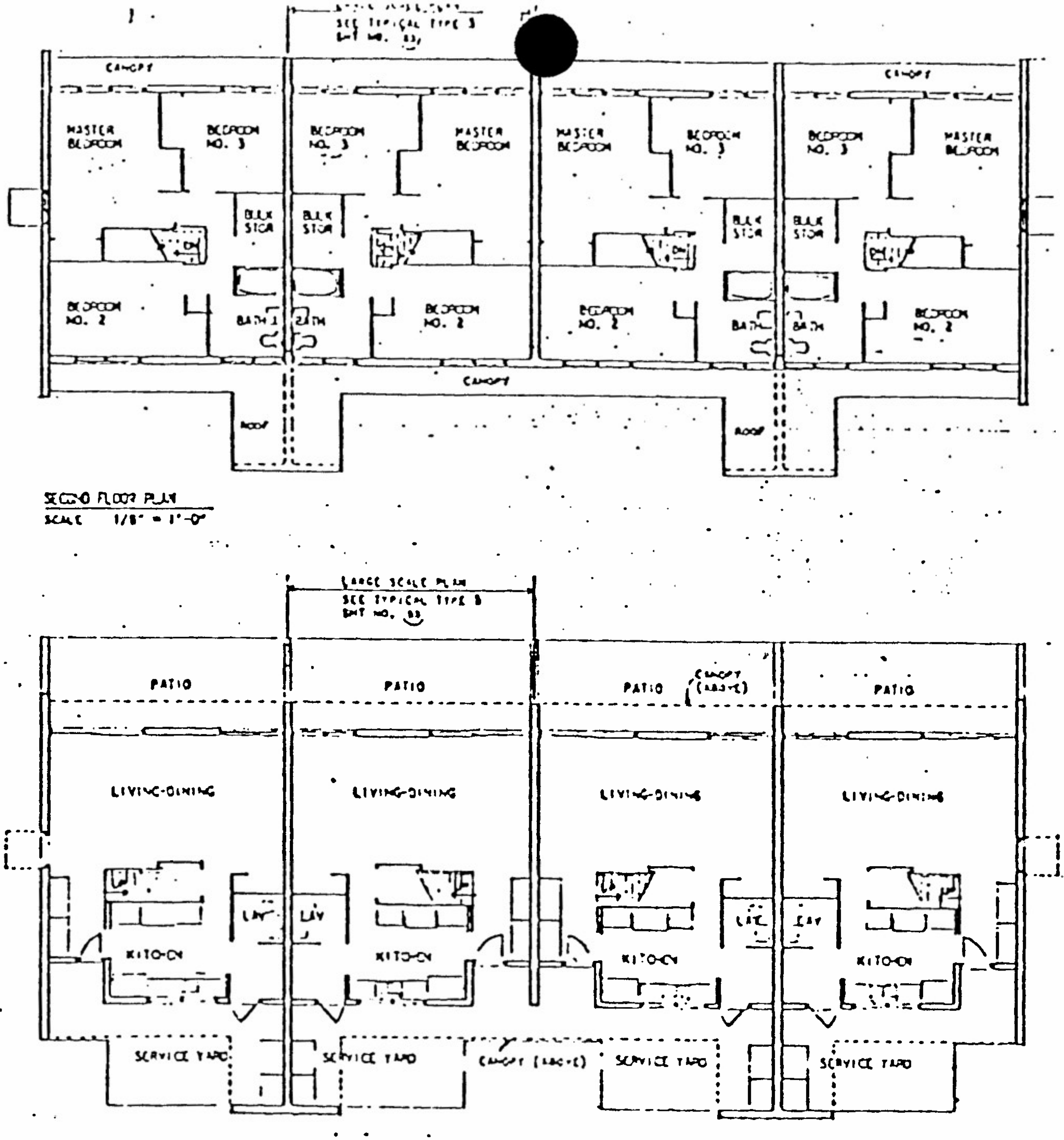


UNIT TYPE 57-VI

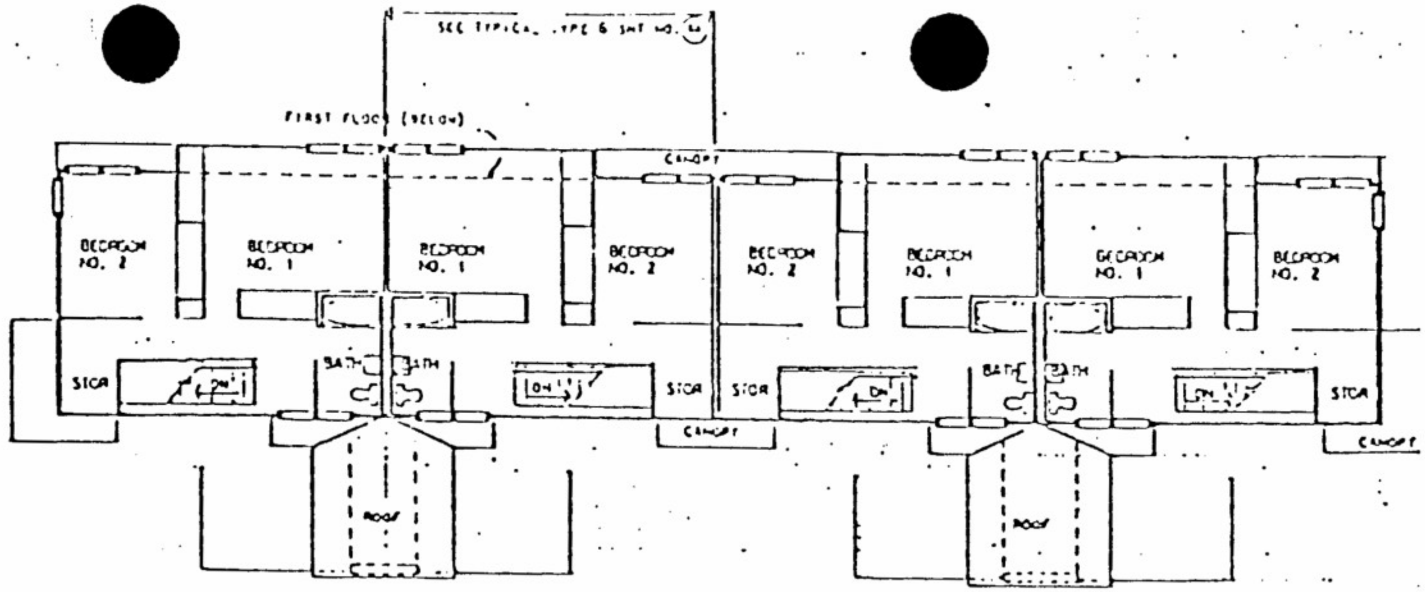


UNIT TYPE 57-VII

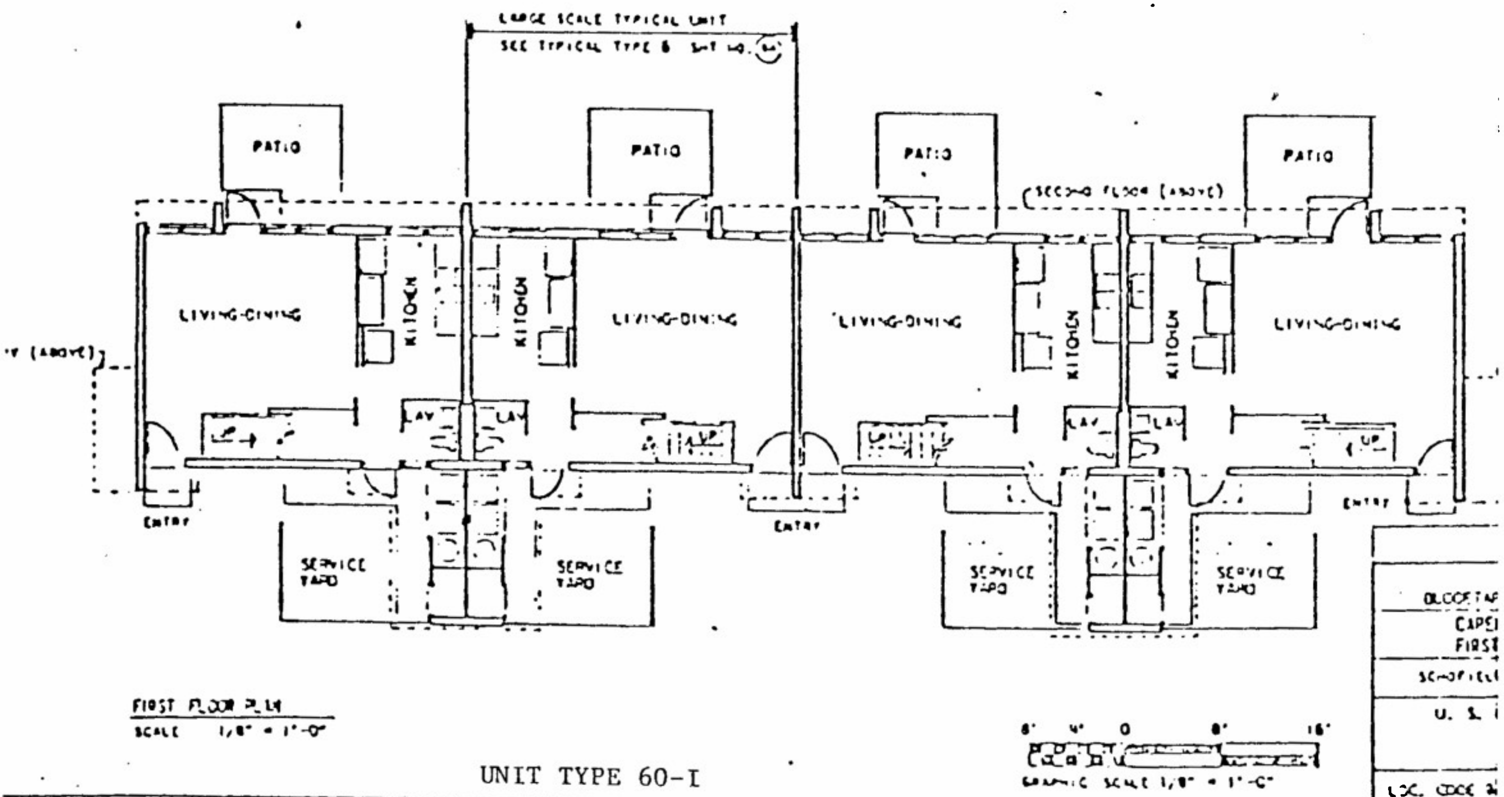
UNIT TYPE 57-VIII



UNIT TYPE 57-IX



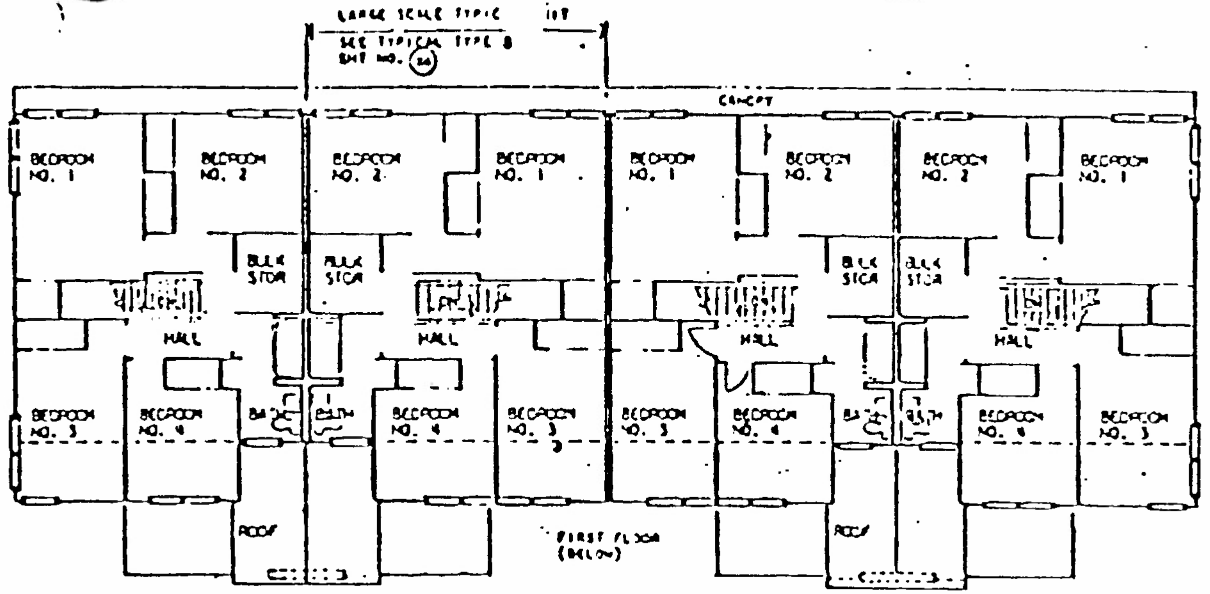
SECOND FLOOR PLAN
SCALE 1/8" = 1'-0"



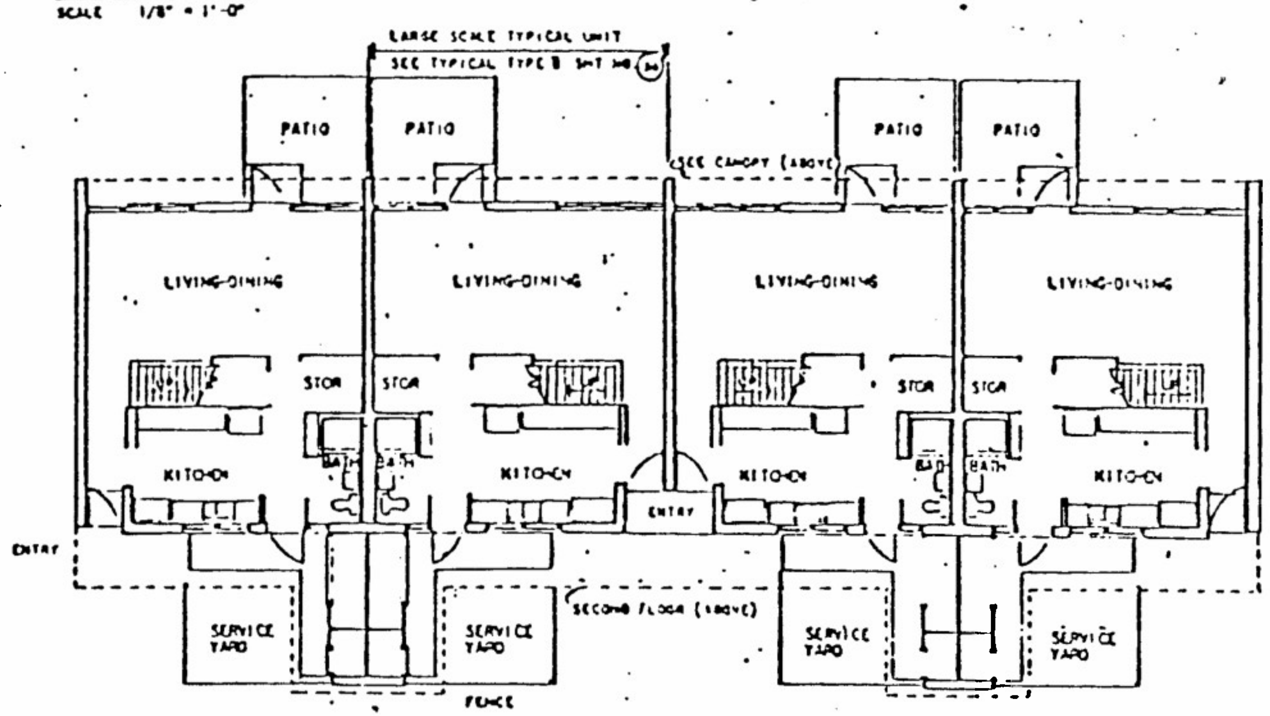
FIRST FLOOR PLAN
SCALE 1/8" = 1'-0"

UNIT TYPE 60-I

MAY 1973

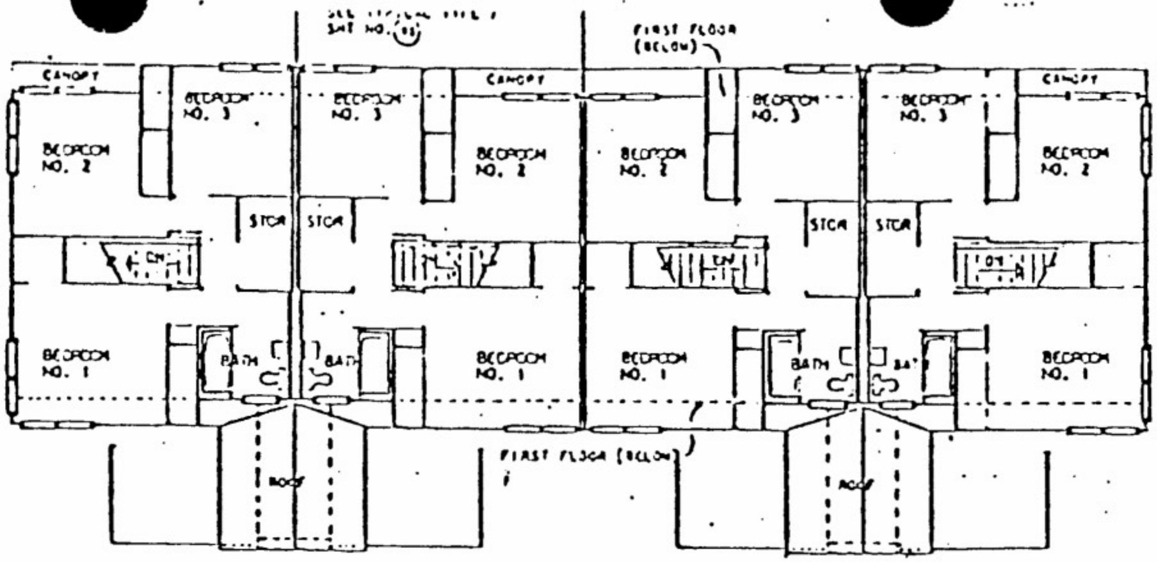


SECOND FLOOR PLAN
SCALE 1/8" = 1'-0"

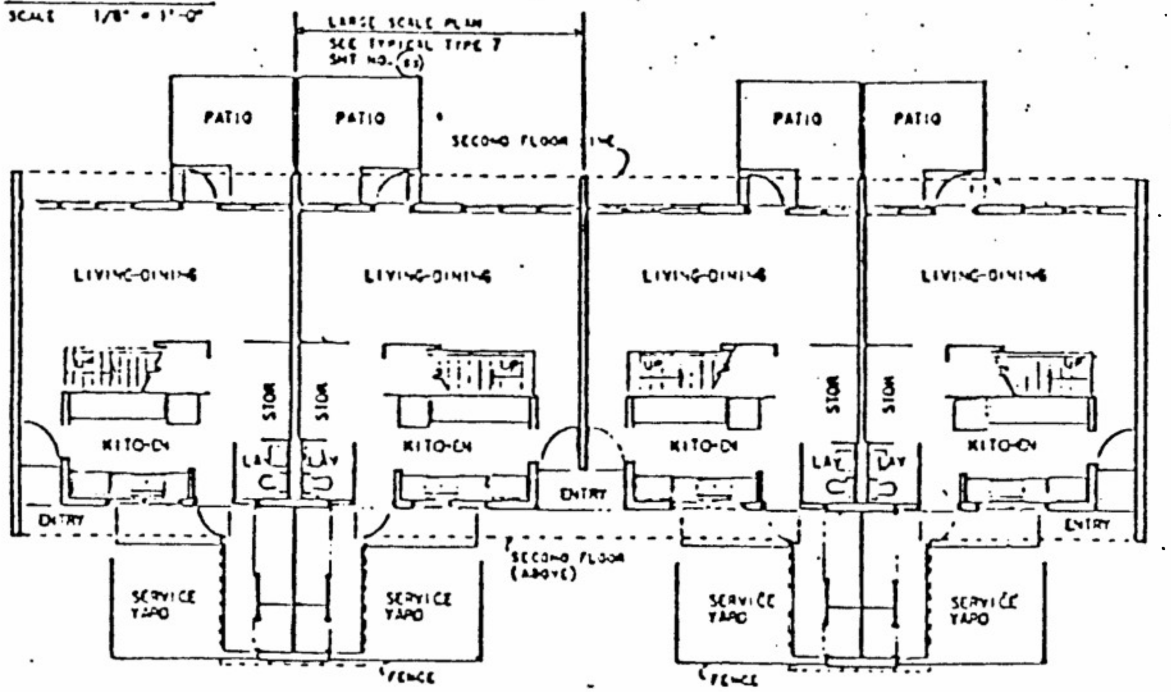


FIRST FLOOR PLAN
SCALE 1/8" = 1'-0"

UNIT TYPE 60-II

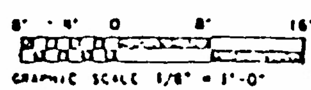


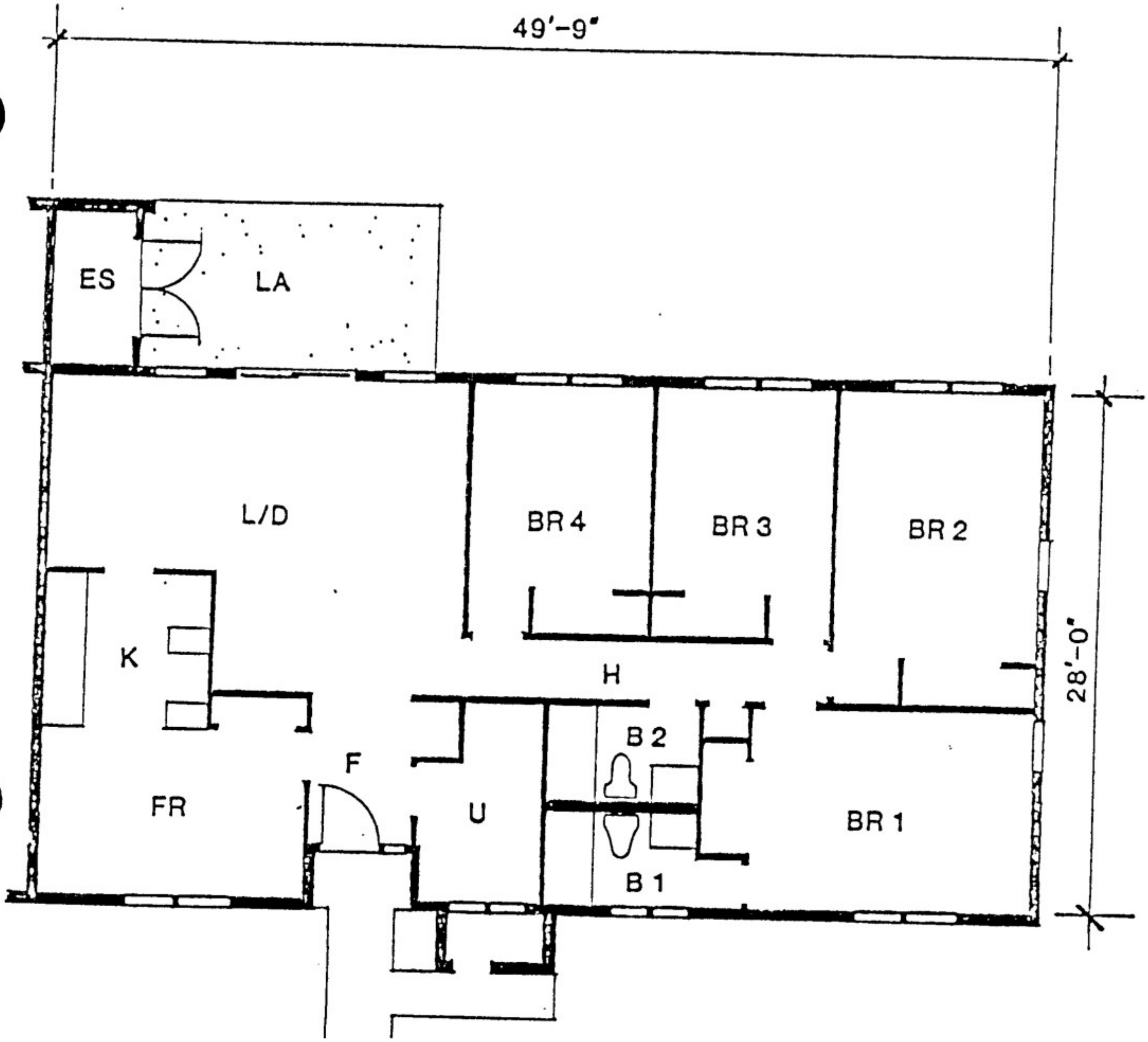
SECOND FLOOR PLAN
SCALE 1/8" = 1'-0"



FIRST FLOOR PLAN
SCALE 1/8" = 1'-0"

UNIT TYPE 60-III





UNIT TYPE 71-I

LOW COST ECO PROPOSAL

1. PROJECT TITLE

Replace Incandescent Lights

2. CURRENT SITUATION

Housing units currently have incandescent light fixtures located throughout the quarters. Incandescent lighting is less efficient than fluorescent lights, which can produce the same effective illumination with approximately 80% less electrical input.

3. PROPOSAL

Existing incandescent bulbs will be removed and new energy saving fluorescent retrofit adapters (ballast and lamp) will be installed in the fixture. Installation of the new fluorescent adapters consists of screwing the adapter base into the existing fixture.

4. PROJECTED SAVINGS

Energy savings were determined by unit type. Savings varied depending on the wattage and number of incandescent fixtures in the unit. A summary of energy savings by unit type is shown in the following table:

Unit Type	# of Units in project	X	Daily Saving per Unit (KWH/day)	X 365 Days/yr =	Annual Savings (KWH/yr)
20-II	14		5.894		30,118
20-III	122		5.523		245,930
20-IV	29		6.885		72,878
20-V	14		4.914		25,110
32-I	11		0.270		1,084
32-II	11		0.270		1,084
32-III	26		6.504		61,728
32-IV	9		5.780		18,987
57-I	8		4.832		14,109
57-II	68		2.220		55,100
57-III	20		1.860		13,578
57-IV	136		2.220		110,201
57-V	102		1.680		62,546
57-VI	24		2.220		19,447
57-VII	6		1.680		3,679
57-VIII	24		2.220		19,447
57-IX	16		2.220		12,965
60-I	20		0.270		1,971
60-II	16		0.270		1,577
60-III	76		0.270		7,490
71-I	5		0.360		657

Total Electrical Savings = 779,691 KWH/yr X 0.003413 MBTU/KWH
= 2,661 MBTU/yr

Total Cost Savings = 779,691 KWH/yr X $0.068/KWH = $53,019/yr

5. ESTIMATED CONSTRUCTION COSTS:

Construction costs varied with the unit type and is summarized as follows:

Unit Type	# of Units in project	X	ECC per Unit ($)	=	ECC ($) (KWH/yr)
20-II	14		835		11,690
20-III	122		805		98,210
20-IV	29		890		25,810
20-V	14		680		9,520
32-I	11		37		407
32-II	11		37		407
32-III	26		1,000		26,000
32-IV	9		945		8,505
57-I	8		645		5,160
57-II	68		370		25,160
57-III	20		260		5,200
57-IV	136		370		50,320
57-V	102		220		22,440
57-VI	24		370		8,880
57-VII	6		220		1,320
57-VIII	24		370		8,880
57-IX	16		370		5,920
60-I	20		37		740
60-II	16		37		592
60-III	76		37		2,812
71-I	5		37		185

Total Estimated Construction Cost = $318,158 (see attached & above)

6. SIMPLE PAYBACK:

$318,158/$53,019 = 6.00

7. SAVING TO INVESTMENT RATIO (SIR):

SIR = 1.94 (see attached)

LABOR RATE : $21.81 + [illegible]% LB - [illegible]

PRO[illegible] Replace Incadescent Lights

TASK DESCRIPTION	QUANTITY NO. OF UNITS	QUANTITY UNIT MEAS	LABOR MH/UNIT	LABOR TOTAL HRS	LABOR UNIT PRICE	LABOR COST	EQUIPMENT UNIT PRICE	EQUIPMENT COST	MATERIAL UNIT PRICE	MATERIAL COST	TOTAL
Unit type 71-I											
9w Fluores. Adaptor	0	EA	0.15		38.2[illegible]				18		
11W Fluores. Adaptor	0	EA	0.15						20		
15W Fluores. Adaptor	1	EA	0.15	0.15	→	5.73			22	22	27.73
								Subtotal			27.73
								Profit	(10%)		2.77
								O/H	(15%)		4.56
								Tax	(4%)		1.40
								Bond	(1%)		0.36
								Total			36.82
NOTE :										SAY	$37.00
1) Mat'l cost quote w/											
Pelsa Lighting (524-3744)											
(Bobby Solomon)											

ESTIMATOR CHECKED BY SHEET OF

DA FORM 5418-R, Apr 85 CONTD

Labor Rate: $21.81 + 35% LB = $30.?? Say $3?.??

Replace Incadescent Lights											
TASK DESCRIPTION	QUANTITY		LABOR				EQUIPMENT		MATERIAL		TOTAL
Unit Type 20-II	NO. OF UNITS	UNIT MEAS	MH/UNIT	TOTAL HRS	UNIT PRICE	COST	UNIT PRICE	COST	UNIT PRICE	COST	
9W Fluores. Adaptor	0	EA			38.20	0			18		
11W " "	4	EA	0.15	0.6		22.92			20	80	102.92
15W " "	19	EA	0.15	2.85		108.87			22	418	526.87
							SUBTOTAL				629.79
							PROFIT		(10%)		62.98
							O/H		(15%)		103.92
							Tax		(4 %)		31.87
							Bond		(1%)		8.29
							TOTAL				836.84
										SAY	$835

DA FORM 5418-R, Apr 85 CONTD

PR Replace Incadescent Lights

ESTIMATOR | CHECKED BY | SHEET OF SHEETS

TASK DESCRIPTION	QUANTITY		LABOR				EQUIPMENT		MATERIAL		TOTAL
Unit Type 20-III	NO. OF UNITS	UNIT MEAS	MH/UNIT	TOTAL HRS	UNIT PRICE	COST	UNIT PRICE	COST	UNIT PRICE	COST	
9w Fluores. Adaptor	8	EA	0.15	1.20	38.20	45.84			18	144	189.84
11W Fluores. Adaptor	0	EA	0.15	0		0			20	0	0
15W Fluores. Adaptor	15	EA	0.15	2.25		85.95			22	330	415.95
								Subtotal			605.79
								Profit	(10%)		60.58
								O/H	(15%)		99.96
								Tax	(4%)		30.65
								Bond	(1%)		7.97
								Total			804.95
NOTE:										SAY $	805
a) Mat'l cost quote w/ Pelsa Lighting (524-3744) (Bobby Solamon)											

DA FORM 5418-R, Apr 85 CONTD

PR[OJECT] Replace Incadescent Lights

TASK DESCRIPTION	QUANTITY NO. OF UNITS	QUANTITY UNIT MEAS	LABOR MH/UNIT	LABOR TOTAL HRS	LABOR UNIT PRICE	LABOR COST	EQUIPMENT UNIT PRICE	EQUIPMENT COST	MATERIAL UNIT PRICE	MATERIAL COST	TOTAL
Unit Type 20-IV											
9w Fluores. Adaptor	2	EA	0.15	0.30	38.2	11.46			18	36	47.46
11w Fluores. Adaptor	7	EA	0.15	1.05	↓	40.11			20	140	180.11
15w Fluores. Adaptor	16	EA	0.15	2.40	↓	91.68			22	352	443.68
								Subtotal			671.25
								Profit	(10%)		67.13
								O/H	(15%)		110.76
								Tax	(4%)		33.97
								Bond	(1%)		8.83
								Total			891.93
										SAY	$890

NOTE:
1) Mat'l cost quote w/ Pelsa Lighting (524-3744) (Bobby Solomon)

DA FORM 5418-R, Apr 85 CONTD

PRC Replace Incadescent Lights | ESTIMATOR | CHECKED BY | SHEET OF

TASK DESCRIPTION	QUANTITY		LABOR				EQUIPMENT		MATERIAL		TOTAL
	NO. OF UNITS	UNIT MEAS	MH/UNIT	TOTAL HRS	UNIT PRICE	COST	UNIT PRICE	COST	UNIT PRICE	COST	
Unit type 20-V											
9w Fluores. Adaptor	2	EA	0.15	0.30	38.24	11.64			18	36	47.64
11W Fluores. Adaptor	6	EA	0.15	0.9	↓	34.38			20	120	154.38
15W Fluores. Adaptor	12	EA	0.15	1.8	↓	68.76			22	240	308.76
								Subtotal			510.78
								Profit	(10%)		51.08
								O/H	(15%)		84.28
								Tax	(4%)		25.85
								Bond	(1%)		6.72
								Total			678.70
NOTE:										SAY $	680
1) Mat'l cost quote w/											
Pelsa Lighting (524-3744)											
(Bobby Solomon)											

DA FORM 5418-R, Apr 85 CONTD

PR Replace Incadescent Lights

TASK DESCRIPTION	QUANTITY NO. OF UNITS	QUANTITY UNIT MEAS	MH/UNIT	LABOR TOTAL HRS	LABOR UNIT PRICE	LABOR COST	EQUIPMENT UNIT PRICE	EQUIPMENT COST	MATERIAL UNIT PRICE	MATERIAL COST	TOTAL
Unit Type 32-I & II											
9w Fluores. Adaptor	0	EA	0.15		38.2[illegible]	0			18		
11W Fluores. Adaptor	0	EA	0.15			0			20		
15W Fluores. Adaptor	1	EA	0.15	0.15	↓	5.73			22	22	27.73
								Subtotal			27.73
								Profit	(10%)		2.77
								O/H	(15%)		4.58
								Tax	(4%)		1.40
								Bond	(1%)		0.36
								Total			36.85
										SAY $	37.00
NOTE:											
1) Mat'l cost quote w/											
Pelsa Lighting (524-3744)											
(Bobby Solomon)											

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DA FORM 5418-R, Apr 85 CONTD

PRC Replace Incadescent Lights

TASK DESCRIPTION	QUANTITY		LABOR				EQUIPMENT		MATERIAL		TOTAL
	NO. OF UNITS	UNIT MEAS	MH/UNIT	TOTAL HRS	UNIT PRICE	COST	UNIT PRICE	COST	UNIT PRICE	COST	
Unit type 32 - III											
9w Fluores. Adaptor	0	EA	0.15		38.2	0			18		
11W Fluores. Adaptor	11	EA	0.15	1.65		63.03			20	220	283.03
15W Fluores. Adaptor	17	EA	0.15	2.55		97.41			22	374	471.41
								Subtotal			754.44
								Profit	(10%)		75.44
								O/H	(15%)		124.48
								Tax	(4%)		38.17
								Bond	(1%)		9.93
								Total			1002.47
NOTE :										SAY $	1000
~) Mat'l cost quote w/											
Pelsa Lighting (524-3744)											
(Bobby Salomon)											

DA FORM 5418-R, Apr 85 CONTD

Replace Incadescent Lights

TASK DESCRIPTION	QUANTITY: NO. OF UNITS	QUANTITY: UNIT MEAS	LABOR: MH/UNIT	LABOR: TOTAL HRS	LABOR: UNIT PRICE	LABOR: COST	EQUIPMENT: UNIT PRICE	EQUIPMENT: COST	MATERIAL: UNIT PRICE	MATERIAL: COST	TOTAL
Unit Type 32-IV											
9w Fluores. Adaptor	0	EA	0.15		38.24	0			18		
11W Fluores. Adaptor	5	EA	0.15	0.75		28.65			20	100	128.65
15W Fluores. Adaptor	21	EA	0.15	3.15		120.33			22	462	582.33
								Subtotal			710.98
								Profit	(10%)		71.10
								O/H	(15%)		117.31
								Tax	(4%)		35.98
								Bond	(1%)		9.35
								Total			944.72
NOTE:										SAY $	945.00
~) Mat'l cost quote w/											
Pelsa Lighting (524-3744)											
(Bobby Solomon)											

DA FORM 5418-R, Apr 85 CONTD

LABOR RATE : $21.01 + [illegible] LB = 38.[illegible]

PROJ: Replace Incadescent Lights

TASK DESCRIPTION	QUANTITY: NO. OF UNITS	QUANTITY: UNIT MEAS	LABOR: MH/UNIT	LABOR: TOTAL HRS	LABOR: UNIT PRICE	LABOR: COST	EQUIPMENT: UNIT PRICE	EQUIPMENT: COST	MATERIAL: UNIT PRICE	MATERIAL: COST	TOTAL
Unit Type 57-I											
9w Fluores. Adaptor	0	EA	0.15	0	38.2[illegible]	0			18		
11W Fluores. Adaptor	7	EA	0.15	1.05		40.11			20	140	180.11
15W Fluores. Adaptor	11	EA	0.15	1.65		63.03			22	242	305.03
								Subtotal			485.14
								Profit	(10%)		48.51
								O/H	(15%)		80.05
								Tax	(4%)		24.55
								Bond	(1%)		6.38
								Total			644.63
NOTE:										SAY $	645
1) Mat'l cost quote w/ Pelsa Lighting (524-3744) (Bobby Salomon)											

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DA FORM 5418-R, Apr 85 CONTD

PR Replace Incadescent Lights

TASK DESCRIPTION	QUANTITY: NO. OF UNITS	QUANTITY: UNIT MEAS	LABOR: MH/UNIT	LABOR: TOTAL HRS	LABOR: UNIT PRICE	LABOR: COST	EQUIPMENT: UNIT PRICE	EQUIPMENT: COST	MATERIAL: UNIT PRICE	MATERIAL: COST	TOTAL
Unit type 57-II, 57-IV, 57-VI, 57-VIII, 57-IX											
9W Fluores. Adaptor	0	EA	0.15		38.2				18		
11W Fluores. Adaptor	0	EA	0.15						20		
15W Fluores. Adaptor	10	EA	0.15	1.5		57.30			22	220	277.30
								Subtotal			277.30
								Profit	(10%)		27.73
								O/H	(15%)		45.75
								Tax	(4%)		14.03
								Bond	(1%)		3.65
								Total			368.46
NOTE:										SAY	$370.00
1) Mat'l cost quote w/ Pelsa Lighting (524-3744) (Bobby Solomon)											

DA FORM 5418-R, Apr 85 CONTD

LABOR RATE : [illegible]

PR Replace Incadescent Lights	QUANTITY		LABOR					EQUIPMENT		MATERIAL		TOTAL
TASK DESCRIPTION	NO. OF UNITS	UNIT MEAS	MH/UNIT	TOTAL HRS	UNIT PRICE	COST	UNIT PRICE	COST	UNIT PRICE	COST	
Unit type 57-III											
9w Fluores. Adaptor	0	EA	0.15	0	38.2[illegible]				18		
11W Fluores. Adaptor	0	EA	0.15	0					20		
15W Fluores. Adaptor	7	EA	0.15	1.05		40.11			22	154	194.11
								Subtotal			194.11
								Profit	(10%)		19.41
								O/H	(15%)		32.03
								Tax	(4%)		9.82
								Bond	(1%)		2.55
								Total			257.92
NOTE :										SAY	$260.00
~) Mat'l cost quote w/											
Pelsa Lighting (524-3744)											
(Bobby Solomon)											

ESTIMATOR CHECKED BY SHEET OF

DA FORM 5418-R, Apr 85 CONTD

PR Replace Incadescent Lights

ESTIMATOR | CHECKED BY | SHEET OF

TASK DESCRIPTION	QUANTITY		LABOR				EQUIPMENT		MATERIAL		TOTAL
Unit type, 57-V & VII	NO. OF UNITS	UNIT MEAS	MH/UNIT	TOTAL HRS	UNIT PRICE	COST	UNIT PRICE	COST	UNIT PRICE	COST	
9w Fluores. Adaptor	0	EA	0.15		38.2				18		
11W Fluores. Adaptor	0	EA	0.15						20		
15W Fluores. Adaptor	6	EA	0.15	0.96		34.38			22	132	166.38
								Subtotal			166.38
								Profit	(10%)		16.64
								O/H	(15%)		27.45
								Tax	(4%)		8.42
								Bond	(1%)		2.19
								Total			221.08
NOTE:										SAY	$220
→ Mat'l cost quote w/											
Pelsa Lighting (524-3744)											
(Bobby Solamon)											

DA FORM 5418-R, Apr 85 CONTD

PRC						ESTIMATOR		CHECKED BY	SHEET OF		
	QUANTITY				BOR		EQUIPMENT		MATERIAL		TOTAL
TASK DESCRIPTION	NO. OF UNITS	UNIT MEAS	MH/UNIT	TOTAL HRS	UNIT PRICE	COST	UNIT PRICE	COST	UNIT PRICE	COST	
Replace Incadescent Lights											
Unit Type 60-I											
									18		
9w Fluores. Adaptor	0	EA	0.15		38.24						
									20		
11W Fluores. Adaptor	0	EA	0.15								
									22	22	27.73
15W Fluores. Adaptor	1	EA	0.15	0.15		5.73					
								Subtotal			27.73
								Profit	(10%)		2.77
								O/H	(15%)		4.56
								Tax	(4%)		1.40
								Bond	(1%)		0.36
								Total			36.82
										SAY	$37.00

NOTE:
a) Mat'l cost quote w/
Pelsa Lighting (524-3744)
(Bobby Salomon)

DA FORM 5418-R, Apr 85 CONTD

LABOR RATE : $21.81 + 75% LB = 38

PRO. Replace Incadescent Lights

TASK DESCRIPTION	QUANTITY: NO. OF UNITS	QUANTITY: UNIT MEAS	LABOR: MH/UNIT	LABOR: TOTAL HRS	LABOR: UNIT PRICE	LABOR: COST	EQUIPMENT: UNIT PRICE	EQUIPMENT: COST	MATERIAL: UNIT PRICE	MATERIAL: COST	TOTAL
Unit Type 60-II											
9w Fluores. Adaptor	0	EA	0.15		38.20				18		
11W Fluores. Adaptor	0	EA	0.15						20		
15W Fluores. Adaptor	1	EA	0.15	0.15	↓	5.73			22	22	27.73
								Subtotal			27.73
								Profit	(10%)		2.77
								O/H	(15%)		4.56
								Tax	(4%)		1.40
								Bond	(1%)		0.36
								Total			36.82
NOTE :										SAY	$37.00
1) Mat'l cost quote w/											
Pelsa Lighting (524-3744)											
(Bobby Solomon)											

DA FORM 5418-R, Apr 85 CONTD

PRO Replace Incadescent Lights

TASK DESCRIPTION	QUANTITY		LABOR				EQUIPMENT		MATERIAL		TOTAL
Unit Type 60-III	NO OF UNITS	UNIT MEAS	MH/UNIT	TOTAL HRS	UNIT PRICE	COST	UNIT PRICE	COST	UNIT PRICE	COST	
9w Fluores. Adaptor	0	EA	0.15		38.2[illegible]				18		
11W Fluores. Adaptor	0	EA	0.15						20		
15W Fluores. Adaptor	1	EA	0.15	0.15		5.73			22	22	27.73
								Subtotal			27.73
								Profit	(10%)		2.77
								O/H	(15%)		4.56
								Tax	(4%)		1.46
								Bond	(1%)		0.36
								Total			36.82
NOTE :										SAY	37.00
~) Mat'l cost quote w/											
Pelsa Lighting (524-3744)											
(Bobby Solomon)											

DA FORM 5418-R, Apr 85 CONTD

LIFE CYCLE COST ANALYSIS SUMMARY
ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP)

LOCATION: Schofield Barracks REGION NO. ____ PROJECT NUMBER ________

PROJECT TITLE Replace Incadescent Lights FISCAL YEAR ________

DISCRETE PORTION NAME ________

ANALYSIS DATE 12/21/90 ECONOMIC LIFE 25 YEARS PREPARED BY dk

1. INVESTMENT COSTS
   A. CONSTRUCTION COST $ 318,158
   B. SIOH (5.5%) $ 17,499
   C. DESIGN COST (10%) $ 31,816
   D. ENERGY CREDIT CALC (1A+1B+1C)X.9 $ 330,726
   E. SALVAGE VALUE OF EXISTING EQUIPMENT $ —
   F. TOTAL INVESTMENT (1D-1E) $ 330,726

2. ENERGY SAVINGS (+) / COST (-)
   ANALYSIS DATE ANNUAL SAVINGS, UNIT COST $ DISCOUNTED SAVINGS

FUEL	COST $/MBTU(1)	SAVINGS MBTU/YR(2)	ANNUAL $ SAVINGS(3)	DISCOUNT FACTOR(4)	DISCOUNTED SAVINGS(5)
A. ELEC	$ 19.94	2,661	$ 53,060	12.12	$ 643,091
B. DIST	$		$		$
C. RESID	$		$		$
D. NG	$		$		$
E. COAL	$		$		$
F. TOTAL			$ 53,060		$ 643,091

3. NON ENERGY SAVINGS (+) / COST (-)
   A. ANNUAL RECURRING (+/-) $ 0
      (1) DISCOUNT FACTOR (TABLE 1) ____
      (2) DISCOUNTED SAVING/COST (3A X 3A1) $ 0

   B. NON RECURRING SAVINGS (+) / COST (-)

ITEM	SAVINGS $ (+) COST $ (-)(1)	YEAR OF OCCURRENCE(2)	DISCOUNT FACTOR (3)	DISCOUNTED SAVINGS (+) COST(-)(4)
a.	$			$ 0
b.	$			$
c.	$			$
d. TOTAL	$			$ 0

   C. TOTAL NON ENERGY DISCOUNTED SAVINGS (+) / COST (-) (3A2+3Bd4) $ 0

   D. PROJECT NON ENERGY QUALIFICATION TEST
   (1) 25% MAX NON ENERGY CALC (2F5 X .33) $ 212,220
      a. IF 3D1 IS = OR 3C GO TO ITEM 4
      b. IF 3D1 IS 3C CALC SIR = (2F5+3D1) : 1F = ________
      c. IF 3D1b IS = 1 GO TO ITEM 4
      d. IF 3D1b IS 1 PROJECT DOES NOT QUALIFY

4. FIRST YEAR DOLLAR SAVINGS 2F3+3A+(3B1d : YEARS ECONOMIC LIFE) $ 53,060

5. TOTAL NET DISCOUNTED SAVINGS (2F5+3C) $ 643,091

6. SIR (IF 1 PROJECT DOES NOT QUALIFY) (SIR)=(5 : 1F)= 1.94